Annual Report of the Department of Agriculture, Assam, for the year 1939-40

BY

DR. S. K. MITRA, M.S., Ph.D., I.A.S.,
DIRECTOR OF AGRICULTURE, ASSAM.

SHILLONG
PRINTED AT THE ASSAM GOVERNMENT PRESS
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FROM

DR. S. K. MITRA, M.S., Ph.D., I.A.S.,

DIRECTOR OF AGRICULTURE, ASSAM.

To

THE SECRETARY TO THE GOVERNMENT OF ASSAM IN THE EDUCATION AND LOCAL SELF-GOVERNMENT DEPARTMENTS, SHILLONG.

Dated Shillong, the $\frac{\textit{28th October}}{\textit{4th November}}$ *1940.*

SUBJECT :—ANNUAL REPORT OF THE DEPARTMENT OF AGRICULTURE, ASSAM.

SIR,

I HAVE the honour to submit herewith the Annual Report of the Department of Agriculture, Assam, for the year 1939-40.

Your obedient servant,

S. K. MITRA,

Director of Agriculture, Assam.

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Annual Report of the Department of Agriculture, Assam, for the year 1939-40

CHAPTER I

General Progress—I was in charge of the Department throughout the year under review. The activities of the Department consisted of researches and investigations on various crops, demonstrations—including the cultivation of boro paddy under irrigation by power-pumps, seed distribution, improvement of livestock, supervision of co-operative milk unions, and other allied activities. Researches on paddy were continued at the Paddy Experiment Stations at Titabar, Karimganj and Habiganj, and those on sugarcane at the Jorhat Experimental Station. Experiments on potato were conducted mainly at the Upper Shillong Farm and those on deciduous fruits at the Fruit Experiment Station at Shillong. Researches on citrus fruits were carried out at the Citrus Fruit Experiment Station at Burnihat. During the year an animal nutrition scheme, financed jointly by the Imperial Council of Agricultural Research, India and the Local Government, was started at the Khanapara Cattle Breeding Farm near Gauhati.

Criticisms are some times levelled against the utility of maintaining the research establishment of the Department. For the information of those who think that no useful purpose is being served by our research section, I take this opportunity of stating that within the short period of its existence it has evolved 103 improved strains of crops—40 of paddy, 20 of sugarcane and 43 of potato. This is an achievement of which any Department may feel proud.

During the year under review, agricultural marketing survey reports on sugar and lac were submitted to the Agricultural Marketing Adviser to the Government of India. These bring the total number of reports submitted to him to 29. Marketing survey of jute and cotton was under progress during the year, during which several marketing development schemes were in operation, a brief account of which is given in Appendix I(*iii*) of this report.

During the year under report, the following five schemes, financed jointly by the Imperial Council of Agricultural Research, India and the Local Government, were functioning under this Department:—

(*i*) Sugarcane Research Scheme.
(*ii*) Deep Water Paddy Research Scheme.
(*iii*) Agricultural Marketing Survey.
(*iv*) Citrus Fruit Research Scheme.
and (*v*) Animal Nutrition Scheme.

The work under all these schemes progressed satisfactorily. Detailed information about them will be found elsewhere in this report.

Demonstration and propaganda for the improvement of agriculture and animal husbandry were continued as before, detailed information about which will be found in Appendix III and IV of this report.

The most important work undertaken during the year was the launching of the Rural Reconstruction Campaign. The work had been taken up in 34 centres, in each of which an Organiser was appointed to carry out the work according to the programme. In the Surma Valley and the Upper Assam Valley the campaign was being supervised by the respective Deputy Director of Agriculture, while in the Lower Assam Valley a Special Rural Uplift Officer was supervising the work. In every centre an Advisory Committee had been formed for bringing to the notice of the authorities the particular needs of the locality and for advising the Departmental officers. It is expected that this work will be continued for a few years. The programme of work seeks to bring within its ambit every aspect of a villager's life. It will not only look to his bodily well-being but will also try to feed his mind with wholesome education. In every rural reconstruction centre schools will be established for the education of boys and girls. Night schools will also be started for the education of illiterate adults. Steps will be taken to immunise the villagers from preventible diseases and they will be taught to observe rules of personal hygiene and rural sanitation. In every centre, propaganda will be carried on for fighting the prejudice against inoculation and vaccination. It will be the aim of the Rural Reconstruction Campaign to improve the earning capacity of the villagers. This will mean the improvement of their capital resources—their land, cattle and implements. They will be provided with better credit facilities. The villagers will be shown the advantages of us ng improved seeds and adopting scientific cultural practices. Ciultivation of money crops will be encouraged. It will also be seen tó that the cultivators sell their produce to the best market. They will be taught to utilise their spare time by taking up some subsidiary industry, such as, spinning and weaving. In fine, the campaign will comprise all activities—industrial, educational and social—which are likely to increase the earnings of the villagers, improve their health, better their outlook on life, or in short, make them better citizens of the State.

During the year under report, a sum of Rs. 5,00,172 was spent by Department, of which Rs. 3,91,991 were spent for crops and soils, Rs. 13,035 for agricultural education and Rs.95,146 for animal husbandry. During the previous year, Rs.3,54,813, Rs.12,612 and Rs.91,260 were spent for crops and soils, agricultural education and animal husbandry respectively.

2. *Agricultural Condition of the Year*—Weather, on the whole, was favourable for crops. Droughts, insects and local floods of short duration, however, caused some damage to autumn and winter rice crops. Weather was unfavourable for jute in the beginning due to prolonged drought, but it improved afterwards to some extent. Weather was generally favourable for rabi crops and spring rice, although report of some damage by insects was received from several places.

Cultivation of rice, rape, mustard and tea remained practically unchanged during the year under review, while that of jute increased.

The average cost of cultivation per acre of paddy, sugarcane and jute for the three valleys for the year 1939-40 was estimated as follows:

Valley	Paddy	Sugarcane	Jute
	Rs. a.	Rs. a.	Rs. a.
1. Surma Valley	23 4	168 0	39 6
2. Lower Assam Valley	29 9	126 12	55 15
3. Upper Assam Valley	28 0	162 3	43 13

The average yield per acre of all crops remained almost the same as that of last year. Only the yield of jute showed an increase as compared with the previous year. During the year, the average yield per acre of paddy, sugarcane and jute amounted to 1,281 lbs.,* 2,228 lbs. and 818 lbs. respectively, the total yield from which amounted to 2,787,360 tons, 37,400 tons and 660,700 bales (of 400 lbs. each) respectively.

* This is an average of the yields of the following paddies :—

Average yield in lbs. per acre

1. Autumn paddy	977
2. Winter paddy	1254
3. Spring paddy	1612
Average yield	1281 lbs. per acre

Prices of agricultural produce did not show any marked change for the better during the year under report. The statement below shows the whole-sale price of rice, raw sugar (*gur*), jute and potato, per maund of 40 seers, in the important markets of Assam during the year 1939-40 :—

Commodities	Karimganj	Goalpara	Gauhati	Dibrugarh	Dhubri	Nowgong	Habiganj	Shillong
	Rs. a.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	Rs. a.
1. Rice— Winter rice unhusked.	2 4	2 3	2 8	2 9	..	..	..	..
Winter rice husked.	3 13	3 14	4 2	4 5	..	..	..	..
Autumn rice unhusked.	2 0	2 13	2 6	2 6	..	..	..	..
Autumn rice husked.	3 11	3 14	4 1	4 2	..	..	..	..
2. Raw Sugar—(Gur) ..	7 10	7 13	7 11	7 0	..	..	..	..
3. Jute	..	..	..	..	9 12	9 11	9 9	..
4. Potato ..	..	..	..	..	..	..	..	2 1

CHAPTER II

EXPERIMENTS AND RESEARCHES

3. *Paddy*—Experiments and researches on paddy were carried on, as before, in the Titabar, Karimganj and Habiganj Paddy Experiment Stations. The experimental work on paddy was continued in the Titabar Farm mainly under (*i*) pure-line selection, (*ii*) cross-breeding and (*iii*) miscellaneous experiments.

(*i*) *Pure-line Selection*—The pure-line selection work mainly consisted of (*a*) type selection, (*b*) observation and (*c*) comparison.

(*a*) *Type Selection*—This year there were 8 new collections in *ahu* and 132 in *sali*. Morphological and economic characters of all these types were recorded.

(*b*) *Observation*—There were 221 types of *ahu* and 651 types of *sali* under observation.

(*c*) *Comparison*—There were 70 types of *ahu* and 55 types of *sali* under comparison, of which 6 types of *ahu* and 6 types of *sali* were under final varietal trials. In *ahu* AS. 20-1, AS. 29 and AS. 48 were found better in yield than our standard type AS. 86. Types AS. 20-1 and AS. 48 were recommended for field-scale trial.

In *sali* one hybrid, S. C. 308-372, a cross between *Laxmijoha* and *Latamaguri*, was recommended for field-scale trial last year. The hybrid proved its superiority in this year's field-scale trial too. Two other fixed hybrids, S. C. 308-51 and S. C. 308-210, were also found to be very promising.

There were altogether 206 hybrids under observation. In all, 25 hybrid types were compared in different classes of paddy.

(*ii*) *Cross Breeding Work*—Inheritance of character, such as, colour of inner glume, kernel colour and size of grain, were studied in F_1 and F_3 generations with interesting results.

(*iii*) *Miscellaneous Experiments*—(*a*) Confounded cultural experiments with 3 factors (spacing, seedling-numbers and age of seedlings) was conducted for the first year. Seedlings of 6 weeks' age gave higher yield than those of 4 weeks. The highest yield was obtained in closest spacing at 6.″

(*b*) An experiment was conducted to find out the optimum water level required for paddy during the season. 3″ and 6″ water levels were identical in yield but both were significant over 0″ (moist condition). Early variety gave the best yield at 6″, whereas late variety yielded the best at 3″.

(*c*) To find out if seed-bed manuring had any effect in the yield of *sali* paddy, an experiment was conducted. The result was negative. Moreover, it was found difficult to uproot the seedlings of 400 and 600 maunds of cowdung (applied in seed beds).

(*d*) *Late Transplanting in Sali*—In the late transplanted varietal trial in *sali*, coarse varieties (specially *Laudumra*, the coarsest) gave the best yield. *Laudumra* gave similar results in the previous year too.

(*e*) An experiment was conducted to find out the best time of maturity and milling qualities of paddy harvested at four different dates. All the varieties showed poor outturns when harvested at 4 weeks after flowering. The finer varieties at 6 weeks and coarser varieties at 5 weeks after flowering gave best yields of paddy grain. The finer varieties had better milling percentage, *i.e.*, more whole grains than coarser varieties.

(*f*) Top-cutting experiment with two varieties, one *asra* and one *sali*, was conducted. In grain yield *asra* was better than *sali*. There was no difference between the different cuttings and the control. In first cutting, outturn of green fodder was 2,128 lbs., whereas in the second cutting the outturn of green fodder was 4,393 lbs. per acre. Considering both grain and fodder it was observed that two cuttings had a greater advantage over others.

(*g*) A trial with 2 best local varieties and 2 recommended varieties was conducted. Our recommended varieties, *Laudumra* and *Latamaguri*, gave an increased outturn of 23 per cent. and 14 per cent. over the local variety *Kolasali* respectively.

In the Karimganj Farm the experimental work on paddy was continued mainly under (*a*) pure-line selection, (*b*) cross-breeding, (*c*) varietal trials, (*d*) cultural experiments, (*e*) genetical investigations and (*f*) miscellaneous experiments. As usual, the classes of paddy that were dealt with were *asra*, *aus*, *sail* and *birain*.

(*a*) *Pure-line Selection*—Besides 50 different types of paddy received during the year from different experimental stations, there were 983 types under observation, of which only 132 were in the selected group and the rest were continued in small plots only to maintain the pure-lines.

(*b*) *Cross-breeding*—The work on cross-breeding at the Karimganj Farm was progressing well. Besides the four recommended hybrid types, *viz.*, *Kerrsail*, *Vijoysail*, S. C. 671-16 and Ar. C. 353-148, two hybrids, *viz.*, S. C. 412-56 and Ar. C. 614-25 b, were found decidedly superior to our standard varieties. These two hybrids were recommended and handed over to the general section for the multiplication of seeds.

There were altogether 8,256 hybrids under observation in the different generations, of which 88 were in F_1, 1,653 in F_2, and 6,076 in F_3. In all 51 hybrid types were compared in the varietal trials.

(*c*) *Varietal Trials*—During the year under report there were altogether 87 types under comparison of which 62 were in the preliminary trials and 25 in the final trials. Of these, 51 were cross-bred types and 36 pure-lines. In the preliminary stage a large number of types was compared by the incomplete blocks methods, while in the final stage a very limited number of types was compared either in randomised blocks or in Latin squares and the up-to-date methods of calculation were adopted to show the significance of difference between the types used. From the results of the final trials of

the last three years, four new types, *viz.*, D. 204-1 in *Dumai*, C. 203-3 in *Chengri*, S. C. 412-56 in *Sail* and Ar. C. 614-25b in *Asra*, were found to be decidedly superior and recommended during the year.

(*d*) *Cultural Experiments*—(*i*) Best age of Seedlings in *Aus*—The experiment was continued for the second year with four dates of sowing and with two varieties. The result of this year was found to be statistically insignificant.

(*ii*) A 3—factor Complex Cultural Experiment in *Sail* (Times of planting, ages of seedlings and number of seedlings in *sail*)—The experiment was being continued for the last two years with four times of planting, four ages of seedlings and three numbers of seedlings in an area of 1·6 acres with 192 sub-plots. Details of the experiment will be found in Appendix II of this report.

(*iii*) *Winter versus Summer Ploughing in Sail* (*Two Factors*)—The experiment was continued for the second year and the result was found to be statistically insignificant.

(*iv*) *Late Transplanting in Sail*—Five types were grown late to study the effect of late transplanting on yield and to find out desirable types which would do moderately well even when transplanting is done very late by the middle of September. S. C. 54-60 and S. C. 94-47 proved to be better than the rest.

(*e*) *Local Versus Recommended Types*—*Dumai*, *Murali* and *Chengri* were compared with a local type and it was found that all the recommended varieties were superior to the local type except *Dumai*, D. 138-6. In *Sail* except *Badshabhog*, which is a fine variety, none of the recommended varieties were found to be inferior in yield to the local one. Both *Kerrsail* and *Latisail* proved to be quite outstanding. In *Asra*, except Ar. 2 *Laki*, which is a finer type, none of the recommended varieties were found to be inferior in yield to the local varieties.

(*f*) *Genetical Investigations*—Inheritance of characters, such as size of grains, height of plants, colour of plants, wild habits, earliness, apiculus and stigma colour, colour of *awns* and *aroma* in rice, with special reference to the size of grains were studied in F_1, F_2 and F_3 generations. Some new crosses were made to study the inheritance of the length of panicle, number of grains, size of grains and number of tillers.

(*g*) *Miscellaneous Experiments*—(*i*) As usual, farm seeds which were to be sent outside were tested and germination percentage was found to be satisfactory.

(*ii*) In the Jorhat Laboratory cooking test of F_2 types was done.

The Deep Water Paddy Research Farm at Habiganj, which is partly financed by the Imperial Council of Agricultural Research, India, is devoted primarily to the improvement of deep water *Amon* and *Boro* paddies. Unfortunately, during the early part of July the station had to face an abrupt and high flood, causing great havoc to the *Amon* crops. This, however, proved a blessing in disguise as it gave a definite indication of flood resistance of the types under study. During the year, the description of the qualitative and some of the quantitative characters, on the line suggested by the Rice Sub-Committee of the Imperial Council of Agricultural Research, was completed in 408 cultures in *Boro* and 473 in *Amon*.

Altogether 180 cultures in *Boro* and 139 in *Amon* were rejected on the principle of eliminating the comparatively poor yielders and the types more susceptible to flood, especially in *Amon*, from the botanically identical cultures.

184 promising types, selected from the single plant culture, were tried in small plots in two different water-levels to get an indication of their comparative yield and to put the promising selections from both the levels under two preliminary varietal trials next year.

The submergence experiment, to study the behaviour of *Amon* plants to different durations and depths of submergence was continued on the line followed last year. Correlation studies were made between the height of plants at the time of submergence and their growth rate below water. It was observed that for two and four week seedlings, there is an association between the initial height of the plants and the growth rate below water, and this association pales with every increase in the depth of submergence.

According to the recommendation of the Rice Sub-Committee of the Imperial Council of Agricultural Research a good amount of work was done in studying the anatomy of deep water paddies. The probability of any correlation between the water response of pure-lines and the area of their air passages, expressed in per cent. of the total area of cellular tissues, was scrutinized. But no such association was noticed.

The border effect was studied for three pure-lines in each of *Boro* and *Tupa* and two in *Bashful*. It was observed that alley induced better tillering in *Boro* and *Bashful*. The effect of alley

on ear-length was very feeble and occasionally perceptible. But it could not cause any significant variation in the height of *Boro* plants.

Altogether 454 hybrid cultures, selected from seven crosses between *Aus* and *Boro*, were studied for F_3 and F_4 generations. The study of the inheritance of *lemma* and *palea* in four crosses confirmed the previous ratios.

53 types, belonging to different groups of *Amon*, and 58 in *Boro* were tried in 13 varietal trials. In *Amon* the types 129, 49-2, 249, 268, 48-14, 29-1, 51-5-5, 52-8, 185 and 133 gave consistently high yield for the last two years. In *Boro* probably due to large number of types involved in almost every trial, the difference among them was not very well marked. But it is interesting to note that many of the selected types tended to give higher yields than the local varieties, used as control. The important findings from the cultural experiments may be summarised below :—

(*i*) The presence of sufficient moisture in the soil at the time of sowing and a sufficient interval (preferably six weeks) between the sowing and the advent of flood are the indispensable qualifications for the best time of *Amon* sowing.

(*ii*) A seed rate of 75-90 lbs. per acre is best for dry sowing in *Amon*. The optimum dose for wet sowing is 75 lbs. per acre.

(*iii*) A good crop of *Amon* can be expected if the sowing can be done before the second week of May.

(*iv*) Under no circumstances, *Boro* transplanting should be carried beyond 11th January.

(*v*) It is profitable to give two weedings to the *Boro* crops after the transplatation. The extra yield due to weeding more than repays its cost.

(*vi*) Early broadcasting in *Boro* is as good as transplantation.

(*vii*) The best seeds rate for the seed bed of *Boro* is 560 lbs. per acre.

4. *Sugarcane*—The Sugarcane Research Scheme, partly financed by the Imperial Council of Agricultural Research, was in its sixth year of working. The departmental work was carried on as usual. A detailed report on the co-ordinated research work on sugarcane at the Jorhat Farm will be found in the Annual Report of the Station, which is issued as a separate publication by the Imperial Council of Agricultural Research. A summary of the results is given in Appendix I (*i*) of this report.

The work on sugarcane was mainly under chemical control and consisted of studies of new Coimbatore canes, both in nursery and observation plots, including periodical analysis of juice and varietal, manurial and cultural experiments, both in plant and ratoon canes.

The total rainfall at the station amounted to 73·93″ compared with the normal precipitation of 83.62″. It was both deficient and ill-distributed. There was practically no rainfall during the months of November, December and January, which markedly shortened the growth period of the crop. As a consequence, the average outturns of the cane crop, both in plant and ratoon canes, were poorer than usual.

Seven new varieties of cane, received from Coimbatore in 1939, were under observation in the nursery, all of which have been replanted for further observation next year.

There were 39 varieties of cane in the observation plots, including 23 new varieties of cane received from Coimbatore in 1938 and the standard variety Poj. 2714. Their percentage of germination and botanical characters were studied in detail from time to time. Eight varieties of cane have been finally rejected either due to poor growth or diseased condition, the rest have been replanted for further observation.

The juice from 23 selected varieties of cane from the observation group, including the standard variety Poj. 2714 and the variety Co. 419, were periodically analysed at an interval of a month commencing from November, 1939.

The quality of *gur* produced at the farm was satisfactory and the Rohilkhand "Bel" furnace gave efficient and good results for production of *gur* on a large scale. The methods of preservation and storage of *gur*, either in earthenware pots sealed in praffin or in empty kerosene oils tins duly soldered, gave very satisfactory results.

The experiments on sugarcane, during the year under report, mainly consisted of simple varietal trials in semi-final and final stages, along with a few manurial and cultural experiments, both in plant and ratoon canes.

In varietal trials in both plant and ratoon canes, the varieties Co. 419, Co. 421 and CoJ.1 came out best and fully maintained their previous reputation. They were found to be decidedly superior to most other varieties of the farm. Co. 419 has already been distributed to the cultivators and its performance outside has been noted to be excellent. It has also a high ratooning capacity and is fairly immune from insect troubles and diseases. It has also been found to be doing very well under different conditions of soil. Co.421 is also a good variety but its quality of juice is poor. Coj.1 is another very promising cane which has not yet been released.

The variety Co. 408 and Co. 413 continued to do well. They may be placed in the second group of superior varieties, equal to, or rather better than our standard recommended canes Poj.2714 and Co. 290. Of the new varieties, Co. 418 and Co. 436 were found to be very promising. They will, however, require further trial before final recommendation and distribution to the cultivators. Some of the crossed types of cane between Poj. 2878 and Co. 290 also appeared to be very promising. They will duly be given further trials for confirmation of result. The other new varieties tried were not found up to the mark.

In the green manuring experiment in ratoon canes to find the residual effect of different green manures applied to previous year's plant canes, sunnhemp, as before, gave the highest yield showing an increase of 1·63 tons of stripped cane per acre over control, which was not significant. The increase due to cowpea and dhaincha over control were, respectively 1·09 and 0·70 tons stripped cane per acre. The combined increase in tons per acre in both plant and ratoon canes for the different green manurial treatments came to 6·43 for sunnhemp, 5·26 for dhaincha and 2·72 for cowpea. The experiment has been repeated for more confirmatory results in both plant and ratoon canes.

In the green manuring and rotation experiment in ratoon canes, to find the residual effect of green manures with and without a phosphatic dressing (residual), all the treatments gave some increases over the control plot which was completely fallowed, in both the experiments with Co.290 and Poj.2714. The

average increase due to green manures came to 3·17 tons stripped cane per acre over control and this when added to the increase of 3·50 tons obtained in plant canes last year comes to a total of 6·67 tons which is fairly substantial to show that green manuring has a distinct advantage over fallowing. The residual effect of the phosphatic dressing was not prominent, especially on the green manured plot. With no green manures, however, it gave an increase about 3 tons stripped cane per acre over the fallowed plot. The experiment will be repeated for a few more rotations for more confirmatory results.

In the manurial experiment in ratoon canes to test the residual effect of calcium cyanamide *versus* organic manures, slight increase were obtained over control, which were not at all significant.

The complete nutrient experiment in plant canes on the interactions of nitrogen, phosphate and potash at three levels each, nitrogen gave highly significant increase over no nitrogen. The higher dose of 160 lbs. nitrogen per acre, did not give a proportionate increase over 80 lbs. nitrogen per acre, as the latter gave over no nitrogen treatment. The responses due to phosphate and potash were of much lesser degree which were, however, significant over control. Phosphates acted best with no nitrogen application. With applications of nitrogen, the responses due to phosphates markedly lessened. This is noteworthy from the consideration that the soil of the farm is highly deficient in phosphates. Potash gave steadier increases under almost all conditions. The quality of juice was almost uniform under all treatments. The experiment has been continued in ratoon canes for residual effect of manures and repeated in plant canes for confirmation of results.

In the manurial experiment in plant canes with organic manures 3 levels and inorganic manures 3 levels and their combinations, the results were not up to the mark due to indifferent soil conditions of the field as well as to unfavourable seasonal conditions. Although not significant, organic manure (cowdung) appeared to be slightly better than inorganic manure (nicifos II). The higher dose of 160 lbs. nitrogen failed to produce any appreciable increase over the lesser dose of 80 lbs. nitrogen per acre, in both cases. The combinations of oganic and inorganic manures did not appear to be appreciably better than either of them applied alone. The quality of juice was almost the same with all treatments. The experiment has been repeated in a better field for further confirmation.

In the green manuring experiment in plant canes to find the effect of different green manures grown and hoed under *in situ* before planting of canes, dhaincha gave an increase of 2·53 tons stripped cane per acre over control, which was significant. Sunnhemp did not give encouraging results this year, showing an increase of 1·19 tons of cane per acre over control, which was not significant. Cowpea gave only an increase of 0.30 tons cane per acre over control. It is expected that the residual effect of green manure will be higher next year in ratoon canes.

5. *Potato*—Experiments on potato were conducted at the Jorhat and the Upper Shillong Farms.

At Jorhat the following experiments were taken up: (*i*) an experiment to determine the best time of sowing, (*ii*) a preliminary experiment for comparing the yield of whole tubers against cut tubers, (*iii*) studies of flowering, fertility and sterility of a few varieties of potato, (*iv*) storage experiment, (*v*) experiments on hastening the sprouting of tubers, (*vi*) study of the effect of peeling the skin of tubers, (*vii*) observation on the effect of cutting the tubers in half and (*viii*) an experiment to study the effect of diffused sun light on tubers. The details of these experiments will be found in Appendix II of this report.

In the Upper Shillong Farm, a manurial experiment was taken up to test the effect of compost prepared at the farm as compared to cowdung and oil cake. Compost gave a substantial increase of 67·2 per cent. over control, which was almost significant. Cowdung gave the best result of more than cent per cent. increase over control, followed by oilcake, which gave just cent per cent. increase over control. That manures can play their part very well under indifferent conditions of climate, etc, has been clearly shown by this experiment.

Another experiment to test the effect of different green manures on potato was tried at the same farm. As the green manures could not be grown successfully, the experiment had to be abandoned. The experiment will, however, be tried again next year.

6. *Fruits*—As usual, cultivation and propagation of various acclimatised deciduous fruits were carried on at the Fruit Experiment Station, Shillong, from where 735 grafts of these fruits were supplied to the public, during the year under report.

Weather was not favourable for deciduous fruits. There was a dry spell of hot weather during the flowering season and the rains came in long after the fruits began to set. Hence, the outturn of fruits was very poor.

During the year, quite a large number of apple, pear, peach, apricot, nectarine and plum trees were grafted and it is expected that the least 1,000 grafts will be available for distribution next year. All the stocks were procured locally. The apple stocks, obtained from Kashmir last year, did not thrive inspite of all possible care taken for them. Frame worked trees of a few varieties of apple were very promising.

There were 137 varieties of apple at the Station—71 dessert and 66 cooking. Only about 24 of these seem to be suitable to Shillong climate. As there is no demand for cooking apples, only good dessert varieties are being propagated.

Trials on canning and preservation of fruits were continued as before. Deciduous fruits, such as, apple, pear and plum, were canned in glass jars. Preparation of jam, jelly and marmalade, bottling of fruit juice and artificial drying of fruits were also continued. Moreover, 1,000 one lb. tin cans and a Burpee can sealer were obtained from Calcutta, for experimental canning of deciduous fruits.

All the fruit bearing trees were twice sprayed with Bordeaux mixture and manured with bonemeal. Some of the apple trees, badly attacked with wooly aphis, were successfully sprayed with "Black leaf 40". A large quantity of the insecticide is being obtained for more thorough application. Bitter rot of apple was controlled to some extent by Bordeaux mixture and Bordeaux paste. Bitter rot was the only major disease at the Station which spoiled the majority of fruits and killed many apple trees.

Researches on citrus fruits were being continued, during the year, at the Burnihat Citrus Fruit Experiment Station. This station is being financed jointly by the Imperial Council of Agricultural Research and the Government of Assam. A brief account of the progress of work in this Station is given in Appendix I (*iv*) of this report.

7. *Insect Pests*—During the year, good results were obtained both in the farms and in the cultivators' fields by early rouging of the borer affected sugarcanes.

The serious attack of rice hispa pest was most successfully controlled in the Jorhat and Sibsagar subdivisions by the adoption of some mechanical measures, which appeared to be very

popular with the cultivators. A campaign against rice bugs and swarming caterpillars was conducted successfully in the Jaintia Parganas of the Sylhet District.

Rice leaf hopper did considerable damage to seed beds in Golaghat, but it was controlled by light traps. Paddy swarming caterpillars was also successfully controlled in Simulguri Mauza in Sibsagar. The stored grain pest appeared in the granaries of some private individuals and it was successfully checked.

The citrus trunk borer pest, which is so much dreaded by the growers of citrus fruits and lemons, was radically controlled in certain localities by using carbon bisulphide as a fumigant.

A detailed account of the work of the Entomological Section is given in Appendix II of this report. A brief account of the work of the temporary Entomological Assistant of the Surma Valley will be found in the report of the Deputy Director of Agriculture, Surma Valley in Appendix IV of this report.

8. *Plant Diseases*—The diseases of sugarcane at the Jorhat Farm were under observation and control throughtout the year. 88,193 canes were examined, out of which 8·8 per cent. bacterial rot, 1·8 per cent. red rot, ·7 per cent rind, 2 per cent. top rot and ·1 per cent. smut were noticed. The total percentage of canes affected with various diseases came to 11·7. Of the recommended varieties, Co.419 and Co.313 suffered the least and Poj.2714 and Co. 421 suffered the most. Bacterial rot and smut appeared to be increasing during the year by 4·6 per cent. and ·07 per cent. and red rot, rind and fusarium top rot appeared to be decreasing by 1·4 per cent., ·1 per cent. and ·4 per cent. respectively. The smut disease was noticed in Co.361, Poj.2714 and Co.419.

Yellow orange trees were treated with a mixture of zinc sulphate (zinc sulphate 10 lbs., lime 5 lbs., blood albumen $\frac{1}{4}$ lb. and water 100 gallons). The result awaits to be seen.

Cercospora Concors caused considerable damage to potato at the Kokilamukh and Titabar Farms. It was controlled by spraying the crop with 1 per cent. Bordeaux mixture.

A good number of diseased *pan* was collected from different places of the province. Microscopical e amination revealed Gleosporium, Rhizoctonia and Fusarium from the diseased materials. In no case Phytophthora was definitely found. A temporary Mycological Assistant continued to work for controlling *pan* diseases in the Surma Valley upto the 16th May, 1939. The results of his investigation were not quite satisfactory and no definite remedy has yet been found out to control the *pan* diseases.

Wilt disease was noticed in cotton in two varieties only, *viz.*, Vardas (Coimbatore) and Wagala D. I. E. B. (Allarmya). The percentage of attack was 2·2 in the former and 2·1 in the latter.

A heavy attack of Diplodia Corchori on jute was noticed in the experimental plot at Jorhat. This was reported as a serious pest from many places in the Surma Valley also.

A very serious outbreak of Helminthosporium and Sclerotial diseases was noticed in the Jaintia Parganas. The extent of damage was very serious in many villages.

Foot rot disease appeared in paddy very seriously in the Golaghat Subdivision. Control measures were suggested to the affected parties.

Leaf curl disease of tobacco was noticed at Jorhat. Matihari and country types suffered heavily from Cercospora Nicotiana.

Mahali disease of cocoanut appeared in a gentleman's garden near Jorhat.

Rust disease of wheat was noticed extensively at Kokilamukh.

A more detailed account of the work on mycology will be found in Appendix II and IV(*i*) of this report.

CHAPTER III

DEMONSTRATION

9. *General*—The main items of demonstration during the year, were—(*i*) demonstration with improved varieties of paddy, sugarcane, jute and potato, (*ii*) manurial demonstrations with cowdung, oilcake, bonemeal and various chemical fertilizers, (*iii*) introduction of new crops, such as, groundnut, linseed, various *rabi* crops and fodder crops, (*iv*) introduction of better agricultural implements, (*v*) cultivation of *boro* paddy under irrigation by means of power driven pumps and (*vi*) demonstration of control measures for checking insect pests, etc.

A very brief resume of the progress of work during the year under review is given below, a more detailed account of which will be found in Appendix IV of this report.



A plot of Virginia tobacco grown successfully by a private individual at Barpeta
(Photo by Mr. L. Barthakur)

10 *Paddy*—As usual, the recommended varieties of paddy maintained their superiority over the local types. In the Surma Valley, the best returns were obtained from Bashmati, Boro—Hbj. II, Boro—Hbj. I, Badshabhog, S. C. 638/3, S. C. 671/16, Ausjaria, Dholabadal, Kachalat, Nagrasali and Latisali. Of these, Bashmati, Boro—Hbj. II, Boro—Hbj. I and Badshabhog gave an average increased outturn over the local varieties of 328 lbs., 320 lbs., 311 lbs. and 307 lbs. respectively per acre. In the Upper Assam Valley, Rangaduria proved to be the best of the recommended *Ahu* paddies, while in *Sali* Prashadbhog, Laudumra, Kanaimuluk, Badshabhog and Dhusari did quite well. The outturn of *Sali* paddy was, however, not quite upto expectation as the crop was adversely affected by drought and insects. Demonstrations were also conducted in the Upper Assam Valley with a good number of *Asra* and *Boro* paddies. In the Lower Assam Valley, Kataktara, Rangaduria and Kaimurali gave an average increased yield of 355 lbs., 166 lbs. and 280 lbs. respectively per acre over the local types of *Ahu*, while Hbj. *Amon* 13-20 gave an increased outturn of 405 lbs. per acre over the local type. In this valley a large number of demonstrations were conducted with Indrasali, Latisali, Kerrsali, Bijoysali, Prashadbhog, Badshabhog, Latamaguri, Laudumra, Bengalijoha, Laksmijoha and Kanaimuluk.

As a result of the propaganda and demonstrations conducted by the Department more and more land is being cultivated with improved strains of paddy, which covered, during the year under report, an area of 53,032 acres of land, out of the total acreage of 5,351, 506 under paddies of all kind.

11. *Boro Cultivation under Irrigation*—Demonstrations of the cultivation of *Boro* paddy in precarious *Amon* paddy land under irrigation by means of power driven pumps were continued during the year under report, during which altogether 17 pumps were employed for the purpose. In the Surma Valley, with 10 pumping setts and at a cost of about Rs.6,540 an area of 900 acres was covered with *Boro* paddy from which an yield of about 27,000 maunds of paddy was obtained. In the Lower Assam Valley, with the help of 5 pumps and at a cost of Rs.3,300 an yield of 4,650 maunds of paddy was obtained from an area of 148 acres, while in the Upper Assam Valley 2 pumps irrigated an area of about 150 acres. In the Upper Assam Valley, the outturn of paddy was very poor as the crop was severely damaged by hailstorm.

12. *Sugarcane*—During the year under report, 13,795 acres of land were under improved varieties of sugarcane compared to the total sugarcane acreage of 38,542. The usual demonstrations

with improved varieties of sugarcane, improved *gur* and sugar making implements, etc., were continued all over the province. In the Surma Valley, improved varieties of cane, such as, Co. 213, Co. 290, Co. 313, Co. 419, Co. 408, Co. 421, Co. 361, Poj. 2878 and Poj. 2714, maintained their superiority over the local varieties. Demonstrations with these varieties were also conducted in the Upper and Lower Assam Valley, with promising results. During the year under report, about 3,00,000 improved sugarcane setts were distributed by the demonstration staff for which there was a very widespread demand.

13. *Potato*—Varietal and manurial demonstrations were conducted with potatoes all over the province. In the North Sylhet Subdivision, Shillong seeds gave an increased yield of 635 lbs. per acre over the local seeds, while the Shillong grown Darjeeling variety gave an increased outturn of 871 lbs. per acre. In the manurial demonstrations, preserved cowdung, water hyacinth compost, oilcake and sodium nitrate proved their utility. In the Lower Assam Valley and Upper Assam Valley also these demonstrations proved quite successful. The degree of success attained in introducing improved potatoes will be evident from the fact that about 43 per cent. of the total area under potato in Assam was cultivated with improved strains during 1939-40, during which about 600 maunds of improved potato seeds were issued to the cultivators through the Department.

14. *Other Crops*—The Jute Propaganda Staff, maintained by the Indian Central Jute Committee, continued to carry on development work in the districts of Sylhet, Kamrup, Darrang, Nowgong and Goalpara. They distributed seeds of improved strains of jute and demonstrated the correct methods of extracting and treating jute fibre.

A large number of demonstrations were also carried out with linseed, mustard, pulses, tobacco, groundnut, vegetables, etc.

15. *Fruits*—Cultivation and marketing of fruits were encouraged, as usual. During the year, a large number of grafts, seedlings, suckers, etc., of pineapple, orange, banana, litchi, papaya, etc., were issued to the cultivators by the demonstration staff, who also conducted a good number of demonstrations of grafting and pruning of fruit trees. Pineapple growers of the province are being helped to a considerable extent by the reduction of freight over railways and steamer



Contour ploughing at the Upper Shillong Experimental Farm showing the gradual formation of terraces
(Photo by Mr. R. C. Woodford)

services obtained for pineapple. With a view to increase the facilities for marketing Assam pineapples and oranges in Calcutta, an officer of this Department was stationed there last year, who helped the growers in disposing of their produce without the intervention of middlemen. This work was continued during the year under report, with certain modifications. During the year, fruits worth Rs.15,700 were disposed of through this agency.

16. *Manures*—Quite a good number of demonstrations were conducted during the year with such fertilisers as oilcake, bonemeal, niciphos, ammophos, ammonium sulphate and sodium nitrate. Demonstrations were also carried out for the preservation of cowdung, preservation of compost and water hyacinth ash. During the year, 693 manures pits were dug as compared to 763 of the previous year. A number of demonstrations were also conducted on green manuring with dhaincha, cowpea, etc.

17. *Implements*—The usual demonstrations with improved implements and appliances, such as, Meston plough, planet junior hand hoe, power driven irrigation pump and sugarcane crusher, *gur* boiling pan, three roller sugarcane mill, McGlashan furnace, etc., were continued.

18. *Hills*—The activities of the Department of Agriculture in the hills consisted of terraced rice cultivation, making of dry terraces for other crops, improvement of *jhums*, extension of fruit and potato cultivation, introduction of new crops, etc. Efforts were also made to introduce some practical methods for the prevention of soil erosion. A brief account of the agricultural operations in the hills is given in Chapter IV of Appendix IV of this report.

CHAPTER IV

SUPPLY OF SEEDS, PLANTS AND MANURES

19. *Supply of Seeds, etc.*—The Seed Depots at Jorhat, Gauhati and Sylhet continued to function during the year under report. Seeds, plants, manures, etc., were issued from the Depots for demonstration and sale. The statement below shows

the quantities of seeds, etc., of paddy, potato, vegetables and sugarcane issued during the year :—

Name of seeds	Quantity issued for demonstration	Quantity sold	Total
1. Paddy seed ...	1,397 mds. 29 srs. 8 chs.	938 mds. 16srs. 4 chs.	2,336 mds. 5 srs. 12 chs.
2. Potato seed ...	289 mds. 35srs. 8 chs.	291 mds.	580 mds. 35 srs. 8 chs.
3. Vegetable seed	2,152 pkts. and 9 srs. 13 chs.	30,333 pkts. and 1 md. 33 srs. 14 chs.	32,485 pkts. and 2 mds. 3 srs. 11 chs.
4. Sugarcane setts	2,89,977	Nil	2,89,977 setts.

The seed Depots at Sylhet and Jorhat made a profit of Rs. 1,224-7-3 and Rs. 76-2-0 respectively, while the Gauhati Seed Depot incurred a loss of Rs.72-8-3, during the year under report. Thus, the Department earned a profit of Rs. 1,228-1-0 from the Seed Depots during the year compared to a loss of Rs. 4,283-5-11 and Rs.1,305-15-3 incurred during 1938-39 and 1937-38 respectively. The profit, however, was mainly due to the return of two power driven pumping setts, valued at Rs.2,376-8-0, to the Sylhet Seed Depot by hire-purchasers. It will, however, appear from the following paragraphs that all the Seed Depots worked more satisfactorily during the year than had been possible in 1938-39.

20. *Gauhati Seed Depot*—The principal items of supply from the Gauhati Seed Depot were—647 maunds of paddy, 118 maunds of potato, 11,315 packets and 19 seers and 9 chattaks of vegetable seeds, 37,163 sugarcane setts, 13,950 pineapple suckers, various manures worth about Rs. 300 and improved implements to the value of Rs.4,180-10-0. The assets and liabilities of the Depot amounted to Rs.16,458-12-3 and Rs.16,531-4-6 respectively, resulting in a loss of Rs.72-8-3 during the year compared to a loss of Rs.929-12-6 in 1938-39.

21. *Jorhat Seed Depot*—The main items of issue from the Jorhat Seed Depot were—450 maunds and 34 seers of paddy, 217 maunds, 35 seers and 8 chattaks of potato, 2,18,000 sugarcane setts, 11,052 packets of vegetable seeds, 26,97[illegible] pineapple suckers and 35 sugarcane mills. The assets and liabilities of the Depot amounted to Rs. 13,338-9-9 and Rs.13,262-7-9 respectively, resulting in a net profit of Rs.76-2-0 during the year, compared to a loss of Rs.2,271-6-6 in 1938-39.

22. *Sylhet Seed Depot*—The principal items of supply from the Sylhet Seed Depot were—1,238 maunds, 11 seers and 12 chattaks of paddy, 245 maunds of potato, 34,814 sugarcane setts, 10,118 packets and 1 maund, 24 seers and 2 chattaks of vegetable seeds and various manures worth about Rs. 800. The assets and liabilities of the Depot amounted to Rs. 9,920-13-0 and Rs.8,696-5-9 respectively, resulting in a net profit of Rs.1,224-7-3 during the year, compared to a loss of Rs. 1,082-2-11 in 1938-39.

CHAPTER V

IMPROVEMENT OF LIVESTOCK

23. *General*—Mr. R. C. Woodford, Deputy Director of Agriculture, Livestock, Assam, was on leave from the 12th April up to the 2nd October 1939, for which period Mr. L. K. Handique officiated in his place. During the year under report, the district staff of the Livestock Section consisted of 5 Agricultural Inspectors, 5 Agricultural Demonstrators and 21 Stockmen.

The activities of the Section consisted of supply, breeding and management of cattle, poultry and goats and sheep, and production of fodder. These operations were conducted in the Government Cattle Breeding Farms, Jail Dairies, Village Breeding Centres, Notified Grazing Reserves, through the Livestock Improvement Association of Assam, several Municipalities and Tea Estates and through individuals interested in the betterment of animal husbandry.

A remarkable increase in the demand for better livestock was noticeable during the year. This was due mainly to the propaganda and demonstrations carried out by the Departments of Agriculture and Veterinary.

24. *Government Cattle Breeding Farms*—The work in the Cattle Breeding Farms at Upper Shillong, Khanapara and Sylhet and in the Cattle Section of the Jorhat Farm made satisfactory progress on the whole. At the Upper Shillong Farm, from a herd of 22 cross-bred cows, an average milk yield of 7,365 lbs. per lactation was obtained from each cow. All freshly calved cows yielded over 10 seers of milk per day. The best yield of 11,662lbs. was obtained from the cow No. 59 (Fantasy). This high milk yield was obtained inspite of a severe outbreak of foot-and-mouth disease, which continued for four months. The Khanapara Farm continued to breed Scinde × Assamese grades. The best Scinde×Assamese cow yielded 3,573 lbs. of milk in a lactation, with a daily yield of 8 seers. Scinde × Assamese

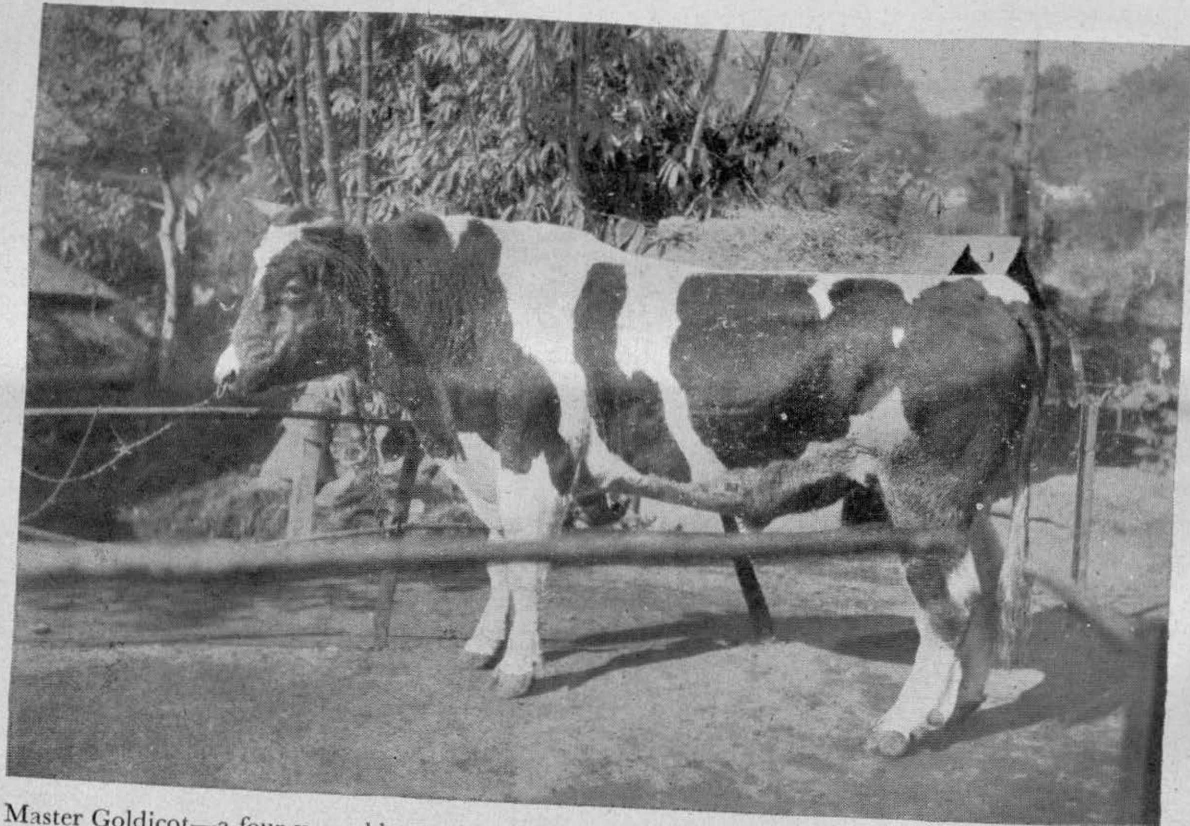
calves weighed at birth from 36 to 40 lbs., whereas local calves at birth weighed from 19-20 lbs. At the Cattle Section of the Jorhat Farm breeding of the 'Jorhat Grey' (combining strong physique with good milking quality) was continued. While in the Khanapara and Jorhat Farms we aim at a general purpose type of animal with medium size, the object of breeding at the Sylhet Farm is the grading up of high milk yielders and no attempt is, therefore, made there to limit the size of the cattle. At Sylhet, the highest milk yield of 6,153 lbs. was obtained from the Scinde cow No. 104, and a half Scinde × local cow yielded 3,906 lbs.

On the 31st March, 1940, there were 116 cows, 28 bulls, 209 youngstock and 15 buffaloes in the Government Cattle Breeding Farms. During the year under report, 23 bulls, 16 cows and 11 youngstock were sold or issued from these farms, bringing the total issue and sale, from the beginning of cattle improvement work in this province in 1929-30 upto the 31st March, 1940, to 294 bulls, 223 cows and 131 youngstock. Farm bulls served 64 cows of the public, bringing the total number of cows so served upto the 31st March, 1940, to 1,416.

25. *Jail Dairies*—Dairies were maintained in the jails at Gauhati, Tezpur, Jorhat, Dibrugarh, Sylhet and Silchar, and in the Tezpur Mental Hospital. The dairies had 58 cows, 8 bulls, and 33 youngstock on the 31st March, 1940. During the year, 100 cows of the public were served by jail bulls, bringing the total number of cows so served upto the 31st March, 1940, to 576. The cattle in the jails were kept in a fine condition and they maintained excellent health.

26. *Breeding through Village Breeding Centres and other Agencies*—For breeding, bulls are kept with Municipalities, Tea Estates, private individuals and at the Village Breeding Centres. During the year under report, 297 Government bulls were kept in this manner, of which 268 bulls were placed at the Village Breeding Centres, which numbered 28. Recorded services from these bulls numbered 8,336. If the unrecorded services are taken into account, the total number of cows served would come to over 10,000. Three thousand and four hundred calves, sired by Government bulls, were actually seen. Many more calves must have been sired by these bulls which escaped inspection due to the movement of cattle from place to place.

The total number of cows served and calves sired by Government breeding bulls, kept with the different agencies named above, from the beginning of these operations upto the 31st March, 1940, came to 19,340 and 6,879 respectively, *plus* about 25 per cent. unrecorded services and births.



Master Goldicot—a four-year old cross-bred bull belonging to Rai Saheb Sonadhar Das Senapati of Shillong, sired by the British Fresian bull "Goldicot" of the Upper Shillong Experimental Farm
(Photo by Rai Saheb Sonadhar Das Senapati)

27. *Grazing Reserves*—During the year under report, cattle breeding operations were continued in 5 Notified Grazing Reserves—1 in Goalpara, 2 in Kamrup, 1 in Nowgong and 1 in Darrang. The reserves covered an area of about 40,000 acres and contained 12,500 cattle, excluding youngstock under the age of two years. On the 31st March, 1940 there were 40 bulls, 9 cows, 2 buffaloes and 10 youngstock belonging to Government in these reserves.

In the Notified Grazing Reserves weedy bulls are castrated and breeding is done by bulls of improved breed. For encouraging the castration of weedy bulls a discriminating grazing fee is levied on them.

These reserves, if properly handled, will in future become a very important source of cattle supply. Already hundreds of cattle of good breeds are purchased by private individuals, especially the *Mymensinghia* immigrants, from these reserves and even the Livestock Section bought 18 bulls from there for issue to the Village Breeding Centres during the year under report.

During the year under review, Government bulls served 1,065 cows in the reserves and 488 calves were recorded as sired by them. All services and births could not, however, be recorded due to the wild conditions of the reserves, but it can be safely assumed that the actual number of services and births must have been at least 50 per cent. more than the number recorded.

From the date of starting this work in 1931 upto the 31st March, 1940, Government bulls served a total number of 4,640 cows and 1,467 calves were recorded as sired by them.

28. *The Livestock Improvement Association of Assam*—Three years have elapsed since the organisation of the Livestock Improvement Association of Assam. The total subscriptions realised for the Association durii g the year amounted to Rs.145-2-0 only. Membership of the Association fell, during the year, from 814 to 109 (including non-subscribing bull-keeping members). It is a great pity that the valuable work that is being done by this well-organised Association will have to be curtailed for lack of public sympathy.

The Association had, during the year, 591 bulls—133 purchased, 159 donated and 299 registered—which performed 4,443 recorded services. The total number of services performed by the bulls of the Livestock Improvement Association upto the 31st March, 1940, came to 11,432.

29. *Total number of Bulls and services performed by them*—Excluding the cattle of the Livestock Improvement Association, the Department had, on the 31st March, 1940, a total of 373 bulls, 194 cows, 17 buffaloes and 273 youngstock, including the cattle of the Digboi Livestock Centre. Government bulls served during the year, altogether 9,565 cows of the public and 3,888 calves were recorded as sired by them. The total number of privately owned cows served and calves sired by Government bulls since the beginning of livestock improvement work in 1929-30 upto the 31st March, 1940, came to 25,972 and 8,346 respectively, *plus* about 25 per cent. unrecorded services and births. The Department also castrated, with the help of the Veterinary Department, 1,888 weedy bulls during the year under report, bringing the total number of bulls castrated since the beginning of these operations upto the 31st March, 1940, to 10,171.

30. *Milk Supply*—Only one milk supply union, namely, the Gauhati Co-operative Milk Societies' Union, continued to function satisfactorily during the year. It dealt with about 5 maunds of milk per day.

31. *Poultry*—During the year, about 60 Rhode Island Red and White Leghorn cocks and hens were issued to villages for breeding and 1,000 cross-offsprings were counted. As usual, heavy losses occurred from diseases, but the improved breeds continued to spread. In all cases, the villagers preferred Rhode Island Reds.

At Pukra, near Habiganj, most encouraging results were obtained in duck breeding. Three types of local ducks, namely, the White Breasted Nageswari, the Sylheti Mete and the Large Cachari Nageswari, were selected there. Adult ducks laid upto 136 eggs in a year. A scheme has been submitted to the Government for taking up this work on a larger scale with funds to be provided by the Imperial Council of Agricultural Research.

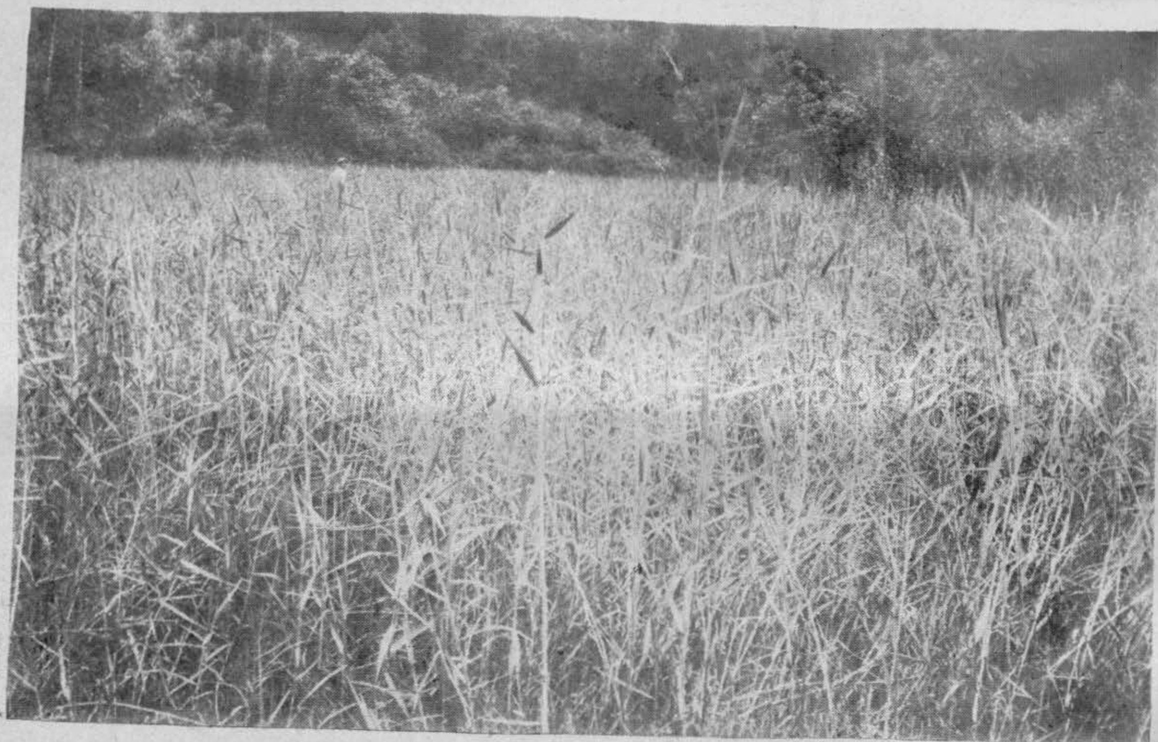
There were 23 male goats of improved breed under the district staff, which produced over 500 kids. In one case, near Habiganj, 2 cross she-goats, bred by a Government he-goat, daily yielded a seer of milk each. Goat breeding was also started at the Khanapara Farm, during the year, and arrangements were made for increasing the supply of male goats to villages.

Sheep breeding, with Bikanir breed, was continued at the Upper Shillong Farm and 26 sheep were issued to the hills.



Jamunapuri × Local cross-bred Goats at the Khanapara Cattle Breeding Farm

(Photo by Mr. R. C. Woodford)



A plot of Para Grass at the Sylhet Cattle Breeding Farm

(Photo by Mr. R. C. Woodford)

32. *Fodder and Grazing*—The Livestock Section carried out demonstrations with various fodder crops and grasses, such as, Napier and Guinea grass, Jowari, Maize, Soybean, Para grass and aquatic grasses. One hundred and fifty-seven fodder gardens were organised in cultivators' fields, compared to 49 gardens organised last year. About 2,00,000 grass roots were distributed. For water-logged areas Para grass was found to be very suitable and it was observed that it thrived in fallow paddy land. Fourteen demonstration silo pits were made in cultivators' fields. But, in spite of our best efforts, we failed to persuade any cultivator to take to this method of fodder making. The work in the observation plot at Pukra was continued.

No meeting of the Provincial Fodder and Grazing Committee could be convened during the year.

33. *Animal Nutrition Scheme*—A 3-year scheme on animal nutrition, jointly financed by the Imperial Council of Agricultural Research and the Local Government, was sanctioned a few years back. Funds for the scheme was provided during the year under report, during which construction of buildings was taken up at the Khanapara Cattle Breeding Farm, where the investigation would be carried out.

CHAPTER VI

FINANCE

34. *Receipts and Expenditure of the Department*—Statements showing the receipts and expenditure of the Department during the year under report will be found in Appendix VIII A and B. The net expenditure incurred during the year 1939-40 and the two previous years is shown below :—

—	1937-38	1938-39	1939-40
	Rs.	Rs.	Rs.
Expenditure	4,97,815	4,58,685	5,00,172
Receipts	63,547	58,951	58,249
Net Expenditure	4,34,268	3,99,734	4,41,923

35. *Financial position of the Farms and Seed Depots*—The following statements show the actual financial position of the various experimental stations run by the Department and also of the three seed depots during the year under report :—

(*a*)

Name of the Station	Receipts, including value of farm produce and stock in hand and also free supply to exhibitions and other farms	Recurring expenditure	Net expenditure
	Rs. a. p.	Rs. a. p.	Rs. a. p.
1. Jorhat Experimental Station ..	5,030 11 6	14,517 14 0	9,487 2 6
2. Titabar Paddy Experiment Station	2,521 7 0	11,109 15 0	8,588 8 0
3. Karimganj Paddy Experiment Station.	4,260 6 0	12,020 11 3	7,760 5 3
4. Upper Shillong Farm	16,329 9 6	28,254 0 0	11,924 6 6
5. Khanapara Cattle Breeding Farm..	7,269 14 9	19,090 4 6	11,820 5 9
6. Sylhet Cattle Breeding Farm ..	6,366 12 6	20,614 5 6	14,247 9 0
7. Shillong Fruit Experiment Station	1,015 1 0	2,887 7 3	1,872 6 3

(*b*)

Name of the Seed Depot	Assets	Liabilities	Loss (—) Profit (+)
	Rs. a. p.	Rs. a. p.	Rs. a. p.
1. Gauhati Seed Depot ...	16,458 12 3	16,531 4 6	(—)72 8 3
2. Jorhat Seed Depot ...	13,338 9 9	13,262 7 9	(+)76 2 0
3. Sylhet Seed Depot ...	9,920 13 0	8,696 5 9	(+)1,224 7 3

CHAPTER VII

MISCELLANEOUS

36. *Agricultural Education*—During the year under report no stipend was awarded for studying agriculture or animal husbandry. Of the five old stipendiaries of this Department at the Agricultural Institute, Allahabad, one passed the final B.Sc. examination in March, 1940. Thus, at the close of the year there were four stipendiaries at the Agricultural Institute, all of whom were studying agriculture. The Agricultural Training Classes at Sylhet and Jorhat continued to function satisfactorily, during the year, with the fourth batch of students in each.

37. *School Gardening*—Gardening in schools, introduced with a view to impart agricultural bias to young boys and girls, was continued during the year under report. It made satisfactory progress in the Surma Valley, where there were 188 school gardens during the year compared to only 128 of the previous year. In the Lower Assam Valley, also the work progressed fairly well in 81 schools. In the Upper Assam Valley, however, it did not make any progress althogh the demonstration staff did their best to popularise gardening in schools.

38. *Agricultural Propaganda, Exhibition, etc.*—During the year under report, the Department participated in a good number of exhibitions and shows, of which the following three may be mentioned—(*i*) Barargaon Agricultural Exhibition in Dhubri, (*ii*) Tajpur Agricultural Show in Sylhet and (*iii*) Lachit Mela in Sibsagar. The Agricultural Inspectors delivered quite a large number of lantern lectures on the improvement of agriculture and animal husbandry, in addition to tendering advice to small groups of cultivators as opportunity occurred.

Attempts were also continued during the year for organising agricultural associations all over the province and our efforts met with considerable success. The Livestock Improvement Association of Assam also continued to function during the year.

39. *Agricultural Publications*—The following publications were issued by the Department during the year under report :—

1. Bulletin No. 5 of 1939	...	The Boro Paddy in Assam.
2. ,, ,, 6 ,, ,,	...	The Menace of Soil Erosion in Assam.
3. ,, ,, 7 ,, ,,	...	Studies on Simple and Complex Cultural Experiments on Paddy at the Karimganj Farm, Assam.

4. Bulletin No. 8 of 1939	...	The Deep Water Aman Paddy in Assam.
5. ,, ,, 9 ,, ,,	...	Tree Fodders (Assamese and Bengali).
6. ,, ,, 10 ,, ,,	...	Aquatic Grasses and Reeds for use as Cattle Fodder (Bengali).
7. Leaflet ,, 29 ,, ,,	...	Pineapple Rot and its Control.
8. ,, ,, 30 ,, ,,	...	Ginger Blight and its Control.
9. ,, ,, 31 ,, ,,	...	Cultivation of Date Palm.
10. ,, ,, 32 ,, ,,	...	Manufacture of Satti Food from Zedeory Roots (Keturi, Sathi).
11. ,, ,, 34 ,, ,,	...	Arrowroot Cultivation.
12. ,, ,, 37 ,, ,,	...	The Making of Silage from Local Grasses in Assam (Assamese, Bengali and Khasi).
13. ,, ,, 38 ,, ,,	...	Para Grass (Brachiaria Mutica, Staff.) A new Fodder Grass for the low-lying areas.
14. ,, ,, 40(*a*) ,,	...	Cultivation f Pineapples (English, Bengali and Assamese).
15. ,, ,, 41 ,, ,,	...	The Cultivation of Peach and Plum in the Khasi and Jaintia Hills.
16. ,, ,, 42 ,, 1940	...	Sunn-hemp Green Manuring.
17. ,, ,, 43 ,, ,,	...	Citrus Green Bug (Rhynchocris Humeralis).
18. Bulletin ,, 4 ,, 1939	...	How to Keep and Improve Soil in the Knasi Hills by proper use of Hill side Land (In Khasi and English).
19. Leaflet ,, 40 ,, ,,	...	Diseases of Cocoanut Palms.
20. ,, ,, 44 ,, ,,	...	Preparing Turmeric for Market. (Supplementary to the Leaflet No. 17 of 1938).

40. *Visits and Inspections*—During the year under report, a large number of official and non-official persons, including a few members of the Legislative Assembly and Council, visited our farms. His Excellency Sir R. N. Reid, K.C.S.I., K.C.I.E., Governor of Assam, paid a visit to the farm at Sylhet and the Hon'ble Maulavi Munawwar Ali, Minister for Agriculture, inspected the farms at Khanapara and Sylhet. The Hon'ble Dr. M. N. Saikia paid a visit to the Khanapara Farm. Dr. F. C. Minett, Director, Imperial Veterinary Research Institute,

Mukteswar, paid a visit to the farms at Sylhet and Khanapara. I inspected all the farms and seed depots and other officers paid regular visits to the farms and seed depots under their charge.

41. *Supervising Staff*—I continued to hold charge of the Department throughout the year. Mr. B. B. Das was in charge of the Surma Valley upto the 9th June 1939. After relinquishing the duties of the Deputy Director of Agriculture, Surma Valley, he went on four months' leave from the 10th June 1939. On the expiry of his leave, Mr. B. B. Das joined as the Superintendent of Agriculture, Lower Assam Valley at Gauhati, on the 17th October, 1939, and continued in that post upto the 7th January, 1940. He went on leave for 2 months and 8 days from the 8th January, 1940, preparatory to retirement (from the 16th March, 1940). Mr. K. K. De, Officiating Superintendent of Agriculture, was in charge of the Lower Assam Valley from the 1st April, 1939 to the 31st May, 1939. I was in charge of that valley from the 1st June, 1939, to the 16th October, 1939, and from the 8th January, 1940, to the 31st March, 1940. Mr. L. Barthakur rejoined as the Deputy Director of Agriculture, Surma Valley, from the 10th June, 1939, on return from four months' leave and continued to hold charge of the Surma Valley Division upto the 7th February, 1940. He was then appointed to the temporary post of Special Rural Uplift Officer and was placed in charge of the Lower Assam Valley Division with headquarters at Gauhati where he joined on the 12th February, 1940. Mr. S. Majid, Economic Botanist, Deep-water Paddy Research Farm, Habiganj, was appointed as the Deputy Director of Agriculture, Surma Valley, with effect from the 8th February, 1940 and continued to hold charge till the end of the year under report. Mr. F. Haque, Deputy Director of Agriculture, continued to hold charge of the Upper Assam Valley throughout the year under report. Mr. R. C. Woodford, Deputy Director of Agriculture, Livestock, went on seven months' leave from the 12th April, 1939, but he was recalled to duty owing to the outbreak of the war and he rejoined his duties on the 3rd October, 1939. He continued to hold charge of the Livestock Section for the rest of the year. Mr. Woodford also continued to supervise the organisation of co-operative milk societies, jail dairies and the Provincial Livestock Improvement Association and its constituent branches. During his absence on leave Mr. L. K. Handique, Senior Marketing Officer, was in charge of the Livestock Section of the Department and Babu N. K. Das, Assistant Marketing Officer, was in charge of the Marketing Section for the same period. Dr. H. K. Nandi continued as the Economic Botanist, Assam, throughout the year. Babu Pareshmohan Ganguli, Officiating Economic Botanist, Deep Water

Paddy Research Farm, Habiganj continued to supervise the work of the Habiganj Farm from the 8th February 1940 up to the end of year. After relinquishing the charge of the Livestock Section on the 3rd October 1939, Mr. L. K. Handique, Senior Marketing Officer, was in charge of the Marketing Section till the end oi the year under report.

42. *Subordinate Establishment*—There were 29 Agricultural Inspectors in the Department, including 1 Fruit Inspector, 1 Inspector of Government Gardens, 5 Agricultural Inspectors, Livestock and 3 temporary Agricultural Inspectors—two for the Training Classes at Sylhet and Jorhat and one for power pump irrigation in the Surma Valley. There were also two Agricultural Instructors—one posted at Sadiya and the other at Aijal. There were 7 Farm Managers, including one for the Deep Water Paddy Research Farm, Habiganj. The number of permanent Scientific Assistants continued to be five, that is, one each for the Chemical, Mycological and Entomological Sections and two for the Botanical Section. One temporary Botanical Assistant, one Farm Manager, one Botanical Field Assistant and two Fieldmen assisted the Economic Botanist, Deep Water Paddy Research Farm, Habiganj in his work. There were also one Chemical Assistant, one Assistant Farm Manager and one Fieldman at the Sugarcane Research Station, Jorhat. An Entomological Assistant temporarily placed in the Surma Valley in 1936-37, continued to work there. A temporary Mycological Assistant, appointed from the 17th November 1938, was also engaged in investigating the problem of *pan* diseases in the Surma Valley up to the 16th May 1939. The Citrus Fruit Research Station, partly financed by the Imperial Council of Agricultural Research, was started near Burnihat on the Shillong-Gauhati Road in September 193). One Horticultural Assistant, one Field Assistant and one Grafter Mali were working there up to the end of the year under report. The Animal Nutrition Scheme, partly financed by the Imperial Council of Agricultural Research, has been started with an Assistant Chemist at the Khanapara Farm since the 25th November, 1939. The appointments of Physiological Chemist and the second Assistant Chemist for the scheme have not yet been made. During the year under report, 2 Assistant Marketing Officers and 1 Market'ng Manager continued to work under the Senior Marketing Officer, Assam.

During the year under report, the special staff, consisting of two Jute Inspectors and 5 Jute Demonstrators, were continuing the jute development work, which is being financed by the Indian Central Jute Committee.

There were 85 Agricultural Demonstrators, including three temporary ones for terraced rice cultivation. The Agricultural Inspectors, Instructors and Demonstrators, excluding the staff appointed by the Indian Central Jute Committee and those for the Co-operative Milk Societies, were distributed as shown below :—

Assam Valley

District	Agricultural Inspectors	Agricultural Demonstrators
1. Kamrup ...	4 (including 2 Agricultural Inspectors, Livestock).	10 (including 2 Agricultural Demonstrators, Livestock).
2. Darrang ...	2	6
3. Goalpara ...	2	7
4. Sibsagar ...	4 (including 1 Agricultural Inspector, Livestock and 1 Agricultural Inspector, Training Class).	9 (including 1 Agricultural Demonstrator, Livestock).
5. Lakhimpur ...	2	4
6. Nowgong ...	1	5 (including 1 Lac Demonstrator).
Total ...	15	41

Surma Valley

District	Agricultural Inspectors	Agricultural Demonstrators
1. Sylhet ...	9 (including 1 Agricultural Inspector, Livestock, 1 Agricultural Inspector, Training Class and 1 Agricultural Inspector, Pump Irrigation).	23 (including 1 Agricultural Demonstrator, Livestock).
2. Cachar ...	2 (including 1 Agricultural Inspector, Livestock).	6 (including 1 Agricultural Demonstrator, Livestock).
Total ...	11	29

Hill Districts	Agricultural Inspectors	Agricultural Demonstrators
1. Khasi and Jaintia Hills.	1	5
2. Lushai Hills ...	1 (Agricultural Instructor) ...	2
3. Naga Hills ...	......	3 (temporary for terraced rice cultivation).
4. North Cachar Hills Subdivision.	......	2 (excluding 2 temporary terraced Rice Instructors).
5. Garo Hills ...	......	2
6. Sadiya Frontier Tract.	1 (Agricultural Instructor) ...	1
Total ...	3	15

Total :—Agricultural Inspectors	... ...	27
Agricultural Instructors	... ...	2
Agricultural Demonstrators...	... ...	85

43. *Appreciation of Services*—My thanks are due to all the Deputy Commissioners and Subdivisional Officers who ungrudgingly extended their co-operation to the Department. My thanks are also due to the Honorary Organisers who, as usual, helped us by arranging demonstrations on their own land and by carrying on propaganda for the improvement of agriculture and animal husbandry.

Babu Manmatha Nath Basu retired from service during the year and I take this opportunity of recording my appreciation of the assistance he rendered as my Personal Assistant. Babu Sudhirendranath Chakrabarti, B.A. (Hons.), my officiating Stenographer, ably helped me in writing up the Annual Report.

APPENDIX I

ANNUAL REPORTS ON RESEARCH SCHEMES PARTLY FINANCED BY THE IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH, INDIA

(i)

Annual Report of the Sugarcane Research Section of the Jorhat Experimental Station for the year 1939-40

(H. K. NANDI, M.SC., Ph. D. (Lond.), F. L. S., F. R. M.S., Economic Botanist, Assam.)

The Sugarcane Research Scheme, which is financed jointly by the Imperial Council of Agricultural Research, India and the Government of Assam, was in its sixth year of working. The work consisted mainly of (*a*) studies of new Coimbatore varieties both in the nursery and observation plots, including periodical analysis of selected varieties and (*b*) varietal manurial and cultural experiments, including analysis of juice from all experimental plots. The work, as before, remained under chemical control and 258 samples of juice were analysed during the year under reportl.

The total annual rainfall, during the year, amounted to 73·93″ compared with the normal precipitation of 83·62″. The rainfall was deficient and was not well distributed. There was practically no rainfall during the months of November, December 1939 and January 1940, which markedly shortened the growth period of the crop. As a consequence, the average outturns of the cane crop, both in plant and ratoon canes, were poorer than usual.

In varietal studies in ratoon canes with normal ripening varieties, Co.419 gave the highest yield as before, which was significantly higher than that from all other varieties. The varieties Co.407, Co. 408, Poj. 2714 and Co. 413 behaved more or less similarly. In another varietal studies in ratoon canes with medium ripening varieties, Co. 421 gave as before the highest yield which was significant over all other varieties. Co.356 gave the next higher yield followed by Co.290. The varieties Co. 360 and Co. 355 behaved unsatisfactorily. It may be noted that the varieties Co. 419 and Co. 421 maintained their previous reputation. The quality of juice in Co. 421 is however, inferior to that of Co. 419. Co. 419 has already been distributed to the cultivators and its performance outside has been noted to be excellent both as plant and ratoon canes. In the semi-final varietal trial in ratoon canes, Coj. 1 (Jorhat selection) which is a crossed type between Poj. 2878 × Co. 290, gave the highest yield of about 30 tons stripped cane per acre. The same variety gave an outturn of 41 tons stripped cane per acre in ratoon canes last year. The variety is almost at par with the other two leading varieties, Co. 419 and Co. 421. In the same experiment, some other crossed types between Poj. 2878 × Co.290 also behaved very satisfactorily. The variety Co. 436 also gave satisfactory outturn, although its quality of juice is poor.

In the green manuring experiment in ratoon canes, to find the residual effect of green manures applied to previous year's plant canes, sunnhemp as before gave the highest yield showing an increase of 1·63 tons stripped cane per acre over control which was not significant. The increases due to

cowpea and dhaincha over control, were respectively, 1·09 and 0·7 tons stripped cane per acre. The combined increases in tons per acre in both plant and ratoon canes for t e different green manurial treatments came to 6·43 for sunnhemp, 5·26 for dhaincha and 2·72 for cowpea. The experiment has been repeated for more confirmatory results in both plant and ratoon canes.

In the green manuring and rotation experiment in ratoon canes to find the residual effect of green manures with and without a phosphatic dressing (residual), all the treatments gave some increase over the control which was completely fallowed, in both the experiments with Co·290 and Poj. 2714. The average increase due to green manures came to about 3·17 tons stripped canes per acre over the control and this, when added to the increase of 3·50 tons obtained from the same treatment in plant canes last year, co ı.es to a total of 6.67 tons stripped cane per acre, which is fairly subtantial to show that green manuring has a distinct advantage over fallowing. The residual effect of the phosphatic dressing was not significant, especially on the green manured plots. With no green manure, however, it gave an increase of 3 tons stripped cane per acre over the completely fallowed plot. The experiment will be repeated for a few more rotations for more confirmatory results.

In the manurial experiment in ratoon canes to test the residual effect of calcium cyanamide *versus* organic manures, the treatments gave slight increase over the control, which were not at all significant.

In the complete nutrient experiment in plant canes on the interactions of nitrogen, phosphate and potash at three levels each, nitrogen gave highly significant increase over no nitrogen. The higher dose of 160 lbs. nitrogen per acre did not give a proportionate increase over 80 lbs. nitrogen per acre as the latter gave over no nitrogen. The responses due to phosphate and potash were of much lesser degree which were, however, significant over the control. The lower doses of phosphate and potash appeared to be more responsive than the higher doses. Phosphates acted best with no application of nitrogen. With applications of nitrogen, the responses due to phosphates markedly lessened. Potash gave steadier increases under almost all conditions. The quality of juice was almost uniform under all treatments. The experiment will be continued for the residual effect of manures in ratoon canes and a fresh experiment has been started on the same lines in plant canes for further confirmation of results.

In the manurial experiment in plant canes with organic manures 3 levels and inorganic manures 3 levels and their combinations, the results were not up to the mark due to indifferent soil condition of the field as well as to unfavourable seasonal conditions. Although not significant, organic manure (cowdung) appeared to be slightly better than inorganic manure (Niciphos II). The higher dose of 160 lbs. ı.itrogen failed to produce any appreciable increase over the lesser dose of 80 lbs. nitrogen per acre, in both cases. This may be due to lower rainfall and undue stress should not be put on it. The combinations of organic and inorganic manures did not appear to be appreciably better than either of them applied alone. The experiment has been repeated in a better field for further confirmation of results.

In varietal trial in plant canes with normal ripening varieties, Co. 419 gave the highest yield closely followed by Coj. 1. The variety Co. 408 was also up to the mark and all these three varieties were significantly superior to the other two varieties, Co. 413 and Poj. 2714. The quality of juice in Co. 419 was also satisfactory. In the varietal trial in plant canes with

medium ripening canes, the variety Co. 418—a new variety tried for the first time under experimental conditions— gave the highest yield closely followed by Co. 421. These two varieties were significantly superior to the other three varieties, Co. 290, Co. 355 and Co. 356. In the semi-final varietal trial, mostly with new varieties, the crossed type No. 4 between Poj. 2878 × Co.290 gave the highest yield. Some other cross types, Nos. 15 and 3, also behaved satisfactorily. The new variety Co. 436 gave promising outturn, although its juice quality is poor, both in plant and ratoon canes. Co. 439 appeared to be hopeful. The variety Co. 331 did not give satisfactory outturn and Co. 435 was the poorest with an yield of less than 10 tons per acre.

In the green manuring experiment in plant canes to find the effect of different green manures grown and hoed under *in situ* before planting of canes dhaincha gave an increase of 2·53 tons stripped cane per acre over the control, which was significant. Sunn hemp did not give encouraging results this year, showing an increase of 1·19 tons of cane per acre over the control, which was not significant. Cowpea gave only an increase of 0·30 tons cane per acre over the control. It is, however, expected that the residual effect of the green manures will be higher next year in ratoon canes.

A.—VARIETAL STUDIES

(1) *Nursery plot*.—Seven new varieties of canes, *viz.*, Cos. 457-459 and Cos. 546-549, received from Coimbatore, in 1939, were under observations in the nursery plots. No detailed observations were made on these canes. Percentage of germination was recorded and their juice was analysed once during the year. All these varieties have been replanted for further observation next year.

(2) *Observation plot*.—There were 39 varieties of cane in the observation plots, including the 23 new varieties of cane received from Coimbatore in 1938 and the standard variety Poj. 2714. The percentage of germination and their morphological characters were studied in detail from time to time.

Eight varieties of cane have been finally rejected either due to poor growth or diseased condition. The rest have been replanted for further observation.

(3) *Periodical analysis of juice*.—Twenty-three selected varieties of cane from the observation group, including the standard cane Poj. 2714 and Co. 419 (from non-experimental area) were periodically analysed at an interval of a month, commencing from November, 1939.

B.—EXPERIMENTS

The experiments mainly consisted of simple varietal trials in semi-final stages, and final stages, one cultural experiment, and a few manurial experiments including the two standard experiments recommended by the Imperial Council of Agricultural Research, both in ratoon and plant canes.

1. Experiments with Ratoon canes

1. *Final varietal experiment with five varieties (Normal ripeners)*.—The experiment was conducted with five varieties in plots of 1/33·6th acre (net), each replicated six times in randomised blocks. All plots received a common application of 200 mds. cowdung *plus* 2000 lbs. oilcake per acre (*i.e.*, 180 lbs. Nitrogen per acre in total).

Varieties

—	Co.407	Co.408	Co.413	Co.419	Poj.2714	General mean	S.E.	C. D. (5 per cent.
(*i*) Mean yield of stripped canes in tons per acre.	23·72	23·24	22·33	27·65	22·62	23·91	·88	2·59
Per cent. on general mean.	99·21	97·19	93·39	115·64	94·60	100	..	..
(*ii*) Juice analysis (analysed on 8th February 1940) per cent. sucrose in juice.	17·80	15·73	16·33	16·53	18·28	..	..	..
Purity ..	91·75	89·38	91·74	87·93	92·79	..	..	..
Per cent. glucose in juice.	·42	Trace	·69	·50	Trace	..	..	..

Conclusion

Co.419, <u>Co.407, Co.408, Poj.2714,</u> Co.413

2. *Final varietal experiment with five varieties (medium ripeners).*—The experiment was conducted with five varieties in plots of 1/33·6th of an acre, (net), each replicated six times in randomised blocks. All plots received an application of 200 mds. cowdung *plus* 2,000 lbs. oilcake per acre (*i.e.*, (180 lbs. N per acre.)

Varieties

—	Co.355	Co.356	Co.360	Co.421	Co.290	General mean	S.E.	C.D.(5 per cent.)
(*i*) Mean yield of stripped canes in tons per acre,	13·81	22·53	15·19	29·77	20·15	20·29	·65	1·92
per cent. on general mean.	68·06	111·04	74·86	146·72	99·31	100	..	..
(*ii*) Juice analysis (analysed on 26th January 1940) per cent. sucrose in juice.	15·31	15·58	13·44	13·90	15·10	..	..	..
Purity	87·04	87·23	84·05	84·29	88·51	..	..	..
Per cent. glucose in juice.	Trace	Trace	Trace	Trace	Trace	..	..	..

Conclusions

Co.421, Co.356, Co.290, Co.360. Co.355

3. *Semi-final varietal experiment with Coimbatore canes.*—The experiment was conducted with 9 varieties in plots of 1/60th of an acre, each replicated 3 times in randomised blocks. One of the varieties, *viz.*, Co.418, was, however, rejected due to poor growth. All plots received a common manurial application of 200 mds cowdung *plus* 2,000 lbs. oilcake (*i.e.*, 180 lbs. Nitrogen in all) per acre.

Varieties

	Co. 436	Co. 439	Co.Jl.	Poj. 2878 × Co. 290—Type 3	Poj. 2878 × Co. 290—Type 4	Poj. 2878 × Co. 290—Type 15	Poj. 2878 × Co. 290—Type 31	Poj. 2714	General mean	S. E.	C. D. (5 per cent).
(*i*) Mean yield of stripped canes in tons per acre.	21·59	17·89	29·47	19·79	24·98	17·44	23·61	18·07	21·61	1·37	4·14
Per cent. on general mean.	99·91	82·79	136·37	91·58	115·59	80·70	109·25	83·62	100	..	..
(*ii*) Juice analysis (analysed on 21st February 1940). Per cent. sucrose in juice.	15·65	15·28	16·21	18·52	17·91	19·32	16·78	18·82	..	..	..
Purity	84·87	84·70	86·68	90·78	88·05	92·26	85·44	90·31	..	..	..
Per cent. glucose in juice	Trace	·62	·74	Trace	·69	Trace	·36	Trace	..	..	..

Conclusions

Coj. 1, Type 4, Type 31, Co.436, Type 3, Poj.2714, Co.439, Type 15,

4. *Green manuring experiment.*—The experiment was to test the residual effects of cowpea, dhainca and sunnhemp, ploughed under previous to growing plant canes, on ratoon canes (Co.361). There were five randomised blocks of four plots each (including a control), the net area of each plot being 1/33·6th of an acre. Ratoon canes received a dressing of 200 mds. cowdung (*i.e.*, 80 lbs. Nitrogen) per acre.

Treatments

——	Cowpea	Dhain-cha	Sunn-hemp	Control	General mean	S. E.	C. D. (5 per cent.)
(*i*) Mean yield of stripped cane in tons per acre.	16·70	16·31	17·24	15·61	16·47	·73	2·24
Per cent. on general mean	101·39	99·03	104·67	94·78	100	..	..
(*ii*) Juice analysis (analysed on 28th February 1940). Per cent. sucrose in juice.	17·68	18·20	17·80	17·80	..	..	..
Purity	92·08	93·81	93·19	92·71	..	..	..
Per cent. glucose in juice	·40	·37	·39	·37	..	..	..

Conclusions

Yield of cane—Sunnhemp, Cowpea, Dhaincha Control.

5. (*a*) *Green manuring and rotation experiment with Co. 290.*—The experiment consisted of four treatments replicated four times in 4×4 latin square in plots of 1/30· 25th acre net The treatments (previous to growing of plant canes in 1938-39) were :—(A) Cowpea green manured in rains during two successive years with an application of 6 maunds alphos per acre previous to sowing cowpea in the first year (1936-37). followed by rabi crops in winter, (B) Same as (A) without application of alphos, (C) Plots cultivated similar to A and B with an application of 6 maunds alphos per acre, but otherwise fallowed, (D) Completely fallowed in both the years.

The rotation adopted in the experiment is to grow plant canes in the first year followed by ratoons in the second year. In the third and fourth years a green crop is ploughed under during rains followed by rabi crops in winter excepting the treatments (C) and (D) which are fallowed. The land is again put under plant canes in the fifth year followed by ratoons in the sixth year and so on. This is the sixth year of rotation. All plots received a common dressing of 200 mds. cowdung *plus* 2000 lbs. oilcake (*i.e.*, 180 lbs. N. in total) per acre.

Treatments

——	A	B	C	D	General mean	S.E.	C.D. (5 percent.)
(*i*) Mean yield of stripped canes in tons per acre.	19·58	17·31	19·17	15·77	17·96	·32	1·11
Per cent. on general mean.	109·02	96·38	106·74	87·81	100	..	..
(*ii*) Juice analysis (analysed on 1st February 1940).							
Per cent. sucrose in Juice.	14·85	15·02	14·66	14·73	..	..	..
Purity ..	87·40	87·89	87·84	87·21	..	..	..
Per cent glucose in juice.	·87	·96	·98	·96	..	..	..

Conclusion

$\overline{A, C,}\ \ \overline{B, D.}$

5. (*b*) *Green manuring and rotation experiment with Poj. 2714.*—The experiment consisted of four treatments replicated four times in 4×4 latin square in plots of 1/30·25th acre net. The treatments (previous to planting of canes) were the same as mentioned under 5(*a*).

This is the 6th year of rotation. All plots received a common dressing of 200 mds. cowdung *plus* 2000 lbs. oilcake per acre.

Treatments

——	A	B	C	D	General mean	S. E.	C. D. (5 per cent.)
(*i*) Mean yield in tons per acre.	23·95	24·28	23·13	20·47	22·96	1·14	3·94
Per cent. on general mean.	104·31	105·75	100·74	89·16	100	..	..
(*ii*) Juice analysis (analysed on 6th February 1940).							
Per cent. sucrose in juice.	16·46	16·94	16·30	16·96	..	..	..
Purity ..	88·83	90·44	89·41	90·07	..	..	..
Per cent. glucose in juice.	Trace	Trace	Trace	Trace	..	..	..

Conclusion

B, A, C, D.

6. *Preliminary manurial experiment with calcium cyanamide.*—The experiment consisted of 3 treatments (including a control) in 3×3 latin square in plots of 1/60th of an acre. The object was to test the residual effects of cowdung 175 mds. *plus* mustard oilcake 1,000 lbs. (that is, 120 lbs. Nitrogen in total) per acre, and 600 lbs. granular calcium cyanamide (that is, 120 lbs. Nitrogen in total) per acre (applied to plant canes) on ratoons of Co. 419. All plots of ratoon canes, including the control, received a common dressing of 125 mds. cowdung (50 lbs. N.) per acre.

Residual effect of A, B, C

—	A (Control)	B (175 mds. cowdung + 1000 lbs. oilcake per acre)	C (600 lbs. granular calcium cyanamide per acre)	General mean	S. E.	C. D. (5 per cent.)
(*i*) Yield of canes in tons per acre.	20·05	22·02	21·12	21·06	·76	4·59
Per cent. on general mean.	95·20	104·56	100·24	100	..	..
(*ii*) Juice analysed on 14th February 1940.						
Per cent. sucrose in juice	17·23	17·59	17·13	..	..	..
Purity	88·54	89·93	87·13	..	..	..
Per cent. glucose in juice	Trace	Trace	Trace	..	..	..

Conclusion

B, C, A.

II. Experiment with plant canes

1. 3^3 *manurial experiment to study the interactions of three factors, Nitrogen, Potash and Phosphate at 3 levels each in confounded design with partial confounding of some second order interactions.*—The experiment was carried out in confounded design with partial confounding of some second order interactions with 3 complete replications. Net area of each plot was 1/43·1th acre, and all manures were applied before planting. The variety used for the experiment was Poj. 2714 and treatments were: (1) $N_0P_0K_0$, (2) $N_0P_0K_1$, (3) $N_0P_0K_2$, (4) $N_0P_1K_0$, (5) $N_0P_1K_1$, (6) $N_0P_1K_2$, (7) $N_0P_2K_0$, (8) $N_0P_2K_1$, (9) $N_0P_2K_2$, (10) $N_1P_0K_0$, (11) $N_1P_0K_1$, (12) $N_1P_0K_2$, (13) $N_1P_1K_0$, (14) $N_1P_1K_1$, (15) $N_1P_1K_2$, (16) $N_1P_2K_0$, (17) $N_1P_2K_1$, (18) $N_1P_2K_2$, (19) $N_2P_0K_0$, (20) $N_2P_0K_1$, (21) $N_2P_0K_2$, (22) $N_2P_1K_0$, (23) $N_2P_1K_1$, (24) $N_2P_1K_2$, (25) $N_2P_2K_0$, (26) $N_2P_2K_1$, (27) $N_2P_2K_2$. N_0 indicates "no" nitrogen, N_1 indicates 80 lbs. nitrogen per acre as cowdung, N_2—160lbs. nitrogen per acre as cowdung, P_0—"no" phosphate, P_1—60 lbs. phosphate as alphos, P_2—120 lbs. phosphate as alphos, K_0—"no" potash, K_1—75 lbs. K_{20} per acre as sulphate of potash, K_2—150 lbs. K_{20} as sulphate of potash.

SUMMARY OF RESULTS

(a) Yield of stripped canes in tons per acre

With N_0		P_0	P_1	P_2	Average
	K_0 ...	9·96	11·03	12·76	11·25
	K_1 ...	9·15	13·36	17·53	13·35
Potash	K_2 ...	10·16	18·48	19·73	16·12
Average yield	...	9·76	14·29	16·67	13·57
With N_1	K_0 ...	16·51	19·23	19·74	18·49
Potash	K_1 ...	21·42	24·39	21·98	22·59
	K_2 ...	23·55	23·89	23·63	23·59
Average yield	...	20·49	22·50	21·78	21·59
With N_2	K_0 ...	20·03	23·02	25·62	22·89
Potash	K_1 ...	24·04	25·93	26·29	25·42
	K_2 ...	28·60	26·59	26·73	27·31
Average yield	...	24·22	25·18	26·21	25·21

Table (i)

Primary effects—mean yield in tons per acre

Nitrogen		Phosphate		Potash	
N_0	13·57	P_0	18·16	K_0	17·54
N_1	21·59	P_1	20·66	K_1	20·46
N_2	25·21	P_2	21·56	K_2	22·37

S. E.=·604 C.D.=1·81 (Approx.)

Table (ii)

First order interactions—mean yield in tons per acre.

Nitrogen X Phosphate

—			N_0	N_1	N_2	Mean
P_0	...	...	9·76	20·49	24·22	18·16
P_1	...	...	14·29	22·50	25·18	20·66
P_2	...	...	16·67	21·78	26·2[1]	21·55
Mean	...	...	13·57	21·59	25·20	...

Nitrogen X Potash

K_0	...	...	11·25	18·49	22·89	17·54
K_1	...	...	13·35	22·60	25·42	20·46
K_2	...	...	16·12	23·69	27·31	22·37
Mean	...	...	13·57	21·59	25·21	...

S.E.=1·05 C.D =3·15(Approx.)

Phosphate X Potash

—			P_0	P_1	P_2	Mean
K_0	...	...	15·50	17·76	19·37	17·54
K_1	...	...	18·20	21·23	21·93	20·45
K_2	...	...	20·77	22·99	23·36	22·37
Mean	...	...	18·16	20·66	21·55	...

S.E.=1·05 C.D.=3·15 (approximate).

(b) Per cent. on general mean

		P	P_1	P_2
With N_0				
Potash	K_0	49·50	54·82	63·42
	K_1	45·48	66·40	87·13
	K_2	50·49	91·85	98·06
With N_1				
Potash	K_0	82·06	95·58	98·11
	K_1	106·46	121·22	109·24
	K_2	117·05	118·74	117·45
With N_2				
Potash	K^0	99·55	114·41	127·34
	K_1	119·48	128·88	130·67
	K_2	142·15	132·16	132·85

(c) *Juice Analysis (analysed on 2nd—4th April 1940)*

	P_0			P_1			P		
With N_0	% Sucrose	Coeff. of purity	% Glucose	% Sucrose	Coeff. of purity	% Glucose	% Sucrose	Coeff. of purity	% Glucose
Potash K_0 ..	19·24	93·08	Trace	18·76	93·01	Trace	18·64	92·87	Trace
K_1 ..	19·07	92·71	,,	19·17	93·65	,,	19·29	93·32	,,
K_2 ..	19·49	93·39	,,	19·41	93·27	,,	19·33	93·52	,,
Average	19·27	..	..	19·11	..	..	19·09	..	..
With N_1									
K_0 ..	19·58	93·06	Trace	19·19	92·97	Trace	19·21	94·91	Trace
Potash K_1 ..	19·29	93·46	,,	19·68	93·54	,,	19·77	98·69	,,
K_2 ..	20·21	93·39	,,	19·68	93·54	,,	19·88	92·72	,,
Average	19·69	..	..	19·52	..	..	19·62	..	..
With N_2									
K_0 ..	19·49	92·89	Trace	19·36	93·30	Trace	19·19	93·25	·28
Potash K_1 ..	19·53	92·52	,,	19·68	92·92	,,	19·24	93·04	Trace
K ..	19·73	93·29	,,	19·09	92·18	,,	19·68	92·61	,,
Average	19·58	..	..	19·38	..	..	19·37	..	..

Conclusions

Yield of cane

A. Primary effects

1. *Nitrogen.*—Both N_2 (160 lbs. nitrogen per acre) and N_2 (80 lbs. nitrogen per acre) are significantly superior to N_0 (no nitrogen).

N_2 is also significantly superior to N_1 but the increase due to N_2 over N_1 is proportionately lower than that of N_1 over N_0.

There is no deterioration in the quality of juice due to nitrogenous manuring.

2. *Phosphate.*—Both P_2^0 (120 lbs. $P_{2}0_5$ per acre) and P_1 (60 lbs.$P_{2}0_5$ per acre) give significant increase over P_0 (no phosphate). The increase of P_2 over P_1 is not significant.

There is no deterioration in the quality of juice due to phosphate manuring.

3. *Potash.*—Both K_2 (150 lbs. $K_2{}^0$ per acre) and K_1 (75 lbs. $K_2{}^0$ per acre) give significant increase over K_0 (no potash). The increase of K_2 over K_1 is also just significant.

There is no deterioration nor any marked improvement in the quality of juice due to potash manuring.

B. First order interactions

1. *Nitrogen X Phosphate.*—With no nitrogen, both P_2 and P_1 give significant increase over P_0. The increase of P_2 over P_1 is, however, not significant. The other increases due to phosphate with N_1 and N_2 are not significant.

2. *Nitrogen X Potash.*—K_2 invariably gives significant increase over K_0 in all cases with N_0, N_1 and N_2. The increase of K_2 over K_1 is not significant in any case. The increase of K_1 over K_0 is also not significant excepting with N_1.

3. *Phosphate X Potash.*—K_2 also invariably give significant increase over K_0 in all cases with P_0, P_1 and P_2. The increase of K_2 over K_1 is not significant in any case. The increase of K_1 over K_0 is also not significant excepting with P_1. The increase due to phosphate at different levels of potash are not significant in any case.

It may be noted that with almost all levels of phosphate and Potash, $N_2 > N_1 > N_0$.

2. *Manurial experiment with organic manures (3 levels) and inorganic manures (3 levels) and their combinations.*—The experiment was carried out in four randomised blocks of seven plots each. The net area of each plot was 1/40th acre. The variety used was Poj. 2714 and treatments consisted of (1) No application of manure, (2) 80lbs. nitrogen per acre as cowdung, (3) 160 lbs nitrogen per acre as cowdung, (4) 80 lbs. nitrogen per acre as Nicifos II, (5) 160 lbs. nitrogen as Nicifos II, (6) 40 lbs. nitrogen per acre as cowdung plus 40 lbs. nitrogen per acre as Nicifos II, (7) 80 lbs. nitrogen per acre as cowdung *plus* 80 lbs. nitrogen per acre as Nicifos II.

Summary of results

Treatment	1	2	3	4	5	6	7	General mean	S. E.	C. D. (5 per cent.)
(*i*) Yield of canes in tons per acre.	4·30	10·52	13·62	9·97	11·55	9·57	13·88	10·48	·77	2·28
Per cent. on general mean.	41·03	100·38	129·96	95·13	110·21	91·32	132·44	100	..	..
(*ii*) Juice analysis (analysed on 11th March 1940).										
Per cent. sucrose in juice.	19·20	19·06	19·98	19·52	19·56	19·46	19·68	..	..	..
Purity ..	92·09	92·30	93·58	91·43	93·09	92·45	94·12	..	..	..
Per cent. glucose in juice.	Trace	Trace	Trace	Trace	Trace	Trace	Trace	..	..	..

Conclusions

7, 3, 5, 2, 4, 6, 1

All treatments are significantly superior to control with no application of manure. 160 lbs. nitrogen is generally (excepting with nicifos alone) significantly superior to 80 lbs. nitrogen per acre, although the increase of 160 lbs. nitrogen over 80 lbs. nitrogen is proportionately lower than that of 80 lbs. over no nitrogen. Cowdung appears to be a little better than nicifos.

3. *Final varietal experiment with five varieties (normal ripeners)*.—The experiment was conducted with five varieties in plots of 1/33th acre (net), each replicated 4 times in randomised blocks. All plots received a common dressing of 300 maunds cowdung *plus* 1000 lbs. oilcake (=170 lbs. N in total) per acre.

Varieties

——	Co.408	Co.413	Co.419	Coj. 1	Poj.2714	General mean	S. E.	C. D. (5 per cent.)
(*i*) Mean yield of cane in tons per acre.	30·58	23·90	35·37	32·68	23·81	29·27	1·47	4·51
Per cent. on general mean.	104·48	81·65	120·84	111·65	81·35	100	..	..
(*ii*) Juice analysis (analysed on 14th March 1940).								
Per cent. sucrose in juice.	18·76	17·73	19·16	17·39	20·32	..	..	..
Purity	92·37	91·82	90·89	90·19	92·87	..	..	..
Per cent. glucose in juice.	Trace	·29	Trace	·60	Trace	..	..	..

Conclusion

Co. 419, Coj. 1, Co. 408 Co. 413, Poj. 2714.

4. *Final varietal experiment with five varieties (medium ripeners).*—The experiment was conducted with five varieties in plots of 1/33th acre (net), each replicated 4 times in randomised blocks. All plots received a common dressing of 300 mds. *plus* 1000 lbs. oilcake (=170 lbs. N in total) per acre.

Varieties

——	Co.355	Co.356	Co. 418	Co.421	Co. 290	General mean	S. E.	C. D. (5 per cent.)
(*i*) Mean yield of stripped canes in tons per acre.	24·56	23·10	31·48	30·08	26·73	27·19	·83	2·55
Per cent. on general mean.	90·33	84·96	115·78	110·63	98·31	100	..	..
(*ii*) Juice analysis (analysed on 20th March 1940).								
Per cent. sucrose in juice.	17·27	18·60	17·15	18·40	16·58	..	..	..
Purity	90·70	90·56	89·60	97·66	88·95	..	..	..
Per cent. glucose in juice.	·48	·36	Trace	Trace	·48	..	..	..

Conclusion

Co. 418, Co. 421, Co. 290, Co. 355, Co. 356.

5. *Semi-final varietal experiment with Coimbatore canes.*—The experiment was conducted with 8 varieties in plots of 1/60th of an acre, each replicated 3 times in randomised blocks. All plots received a common dressing of 300 mds. cowdung *plus* 100 lbs. oilcake (=170 lbs. N) in total per acre.

Varieties

——	Co. 436	Co. 439	Poj. 2878—Co. 290—Type 3	Poj. 2878—Co. 290—Type 4	Poj. 2878—Co. 290—Type 15	Co. 331	Co. 435	Poj 2714	General mean	S. E.	C. D. (5 per cent.)
(i) Mean yield of stripped canes in tons per acre.	28·88	24·98	26 69	33·25	29·02	18·29	9·62	25·77	24·56	1·75	5·29
Per cent. on general mean.	117·18	101·71	108·67	135·38	118·16	74·47	39·17	101·93	100	..	..
(ii) Juice analysis (analysed on 18th March 1940).											
Per cent. sucrose in juice.	15·92	18·08	18·32	19·00	18·59	17·06	16·60	20·05	..	..	..
Purity	88 69	90·49	92·15	93·23	90·19	90·07	91·01	93·51	..	..	..
Per cent. glucose in juice.	·43	·49	Trace	·61	Trace	Trace	Trace	Trace	..	..	..

Conclusions

Type 4, Type 15, Co. 436, Type 3, Poj. 2714, Co. 439, Co. 331, Co. 435.

6. *Green manuring experiment* —The experiment was carried out in plots of 1/33·6th acre with four treatments each replicated five times in randomised blocks. Treatments were : (1) Cowpea, (2) dhaincha, (3) sunn hemp, each green manured in preceding rains, and (4) control. All plots, including the control, received a common dressing of 150 maunds cowdung *plus* 500 lbs. oilcake (= 85 lbs. N. in total) per acre.

Treatments

	Cowpea	Dhaincha	Sunnhemp	Control	General mean	S. E.	C. D. (5 per cent.)
(*i*) Mean yield of stripped canes in tons per acre.	16·49	18·72	17·38	16·19	17·19	·67	2·06
Per cent. on general mean	95·93	108·90	101·11	94·18	100	..	..
(*ii*) Juice analysis (analysed on 12th April 1940).							
Per cent. sucrose in juice	19·64	19·78	20·12	20·12	..	..	..
Purity	92·73	93·39	94·10	93·67	..	..	..
Per cent. glucose in juice	Trace	Trace	Trace	Trace	..	..	..

Conclusion

Dhaincha, Sunnhemp, Cowpea, Control.

(*ii*)

*Annual Report of the Deep Water Paddy Research Farm, Habiganj, for the year 1939-40**

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Introduction

The Deep Water Paddy Research Farm, Habiganj, completed the Sixth year of its working during the year under report. It is devoted primarily to the improvement of the deep water *Aman* and *Boro* paddies. The programme of work of the farm remained the same, except for the addition of systematic histological studies and the description of qualitative and quantitative characters of the pure lines, as recommended by the Rice Sub-Committee of the Imperial Council of Agricultural Research.

* Partly financed by the Imperial Council of Agricultural Research, India.

II. Climate and Crop

The total rainfall during the year was 84·34″ against the average precipitation of 89·22″. But the year was not very favourable for the *Aman* crop. An abrupt and high flood in the early part of July caused havoc to the *Aman* crop in general and totally submerged some of the cultures which could not keep pace with the sudden rise of water. The outturn was consequently poor. The flood, however, has proved to be a blessing in disguise and is expected to give a definite indication as to the flood-resistant qualities of the types under study. A spell of drought during the months of February and March adversely affected the *Boro* paddy during its flowering period.

III. Research and Investigations

1. *Studies on pure lines.*—The description of quantitative and qualitative characters of pure lines under our study was taken up on the lines recommended by the Rice Sub-Committee of the Imperial Council of Agricultural Research. With the reduced staff of the farm it was not possible to tackle all the quantitative characters in one year. During the year under review, observations on height, tillering and the weight per 1000 grains of paddy were taken in 408 *Boro* cultures, while in *Aman* similar records were taken for height, tillers, panicle-length and number of grains per panicle for 473 cultures.

In the study of variability carried out for different quantitative characters in *Boro*, flowering durations afforded a nice clue for the classification of our *Boro* types in order of earliness as will be seen from the following table :—

TABLE I

(*Showing the variability in the flowering durations of different groups in* Boro *paddies*)

Groups	Number of types under observation	Limit of variability	Mean	Mode	S. D.	C. V.
Kali Boro ..	50	115—123 }*	119·3±·384	117	2·68±·270	2·25±·227
Boro ..	*180 }	115—131	120·7±·347	120	4·6±·246	3·9±·207
Dholi Boro ..	67	116—127	122·7±·221	123	1·79±·156	1·46±·128
Tupa (fine grained).	17	123—129 }*	122·7±·320	127	1·3±·225	1·06±·183
Tupa (coarse grained).	163	122—127	123·8±·107	125	1·3±·073	1·05±·059
Rata :	74	122—127*	124·2±·200	125	1·7±·141	1·4±·125
Bashful ..	27	121—127	125·5±·293	125	1·5±·207	1·2±·165
Pankait ..	8	125—128	126·3±·536	127	1·5±·380	1·2±·303

* Denotes significant difference between the means indicated.

Judging from the significant difference noticed among them, the different groups of *Boro* paddies may be classified as follows :—

Very early—*Kali Boro.*

Early—*Boro.*

Medium—*Dholi Boro* and *Tupa* (fine grained).

Late—*Tupa* (coarse grained) and *Rata.*

Very late—*Bashful* and *Pankait.*

During the year under review 180 cultures in *Boro* and 139 in *Aman* were rejected. We were thus left with 408 and 473 cultures in *Boro* and *Aman* respectively. The principle of rejection was to eliminate the comparatively poor yielders and the types more susceptible to flood, specially in *Aman* from the botanically identical cultures.

One hundred eighty-four promising types, suited to different water-levels, were put under two series of observation plots of 12′×10′ each—39 types being laid out in a higher area and 145 in a lower area. The object of this mass culture was to get some indication of the comparative yield of the types under field conditions. The promising selections from both the areas will be put under two preliminary varietal trials later on.

2. *Submergence studies.*—The experiment to study the behaviour of *Aman* plants under different durations and depths of submergence was continued on the line followed last year. Two, four, six, eight and ten-week old plants of an early and a late variety of *Aman* were subjected to two sets of treatments, namely, (*a*) different durations of submergence—4, 8 and 12 days and (*b*) different depths of submersion—6, 10 and 14 inches. All treatments were replicated four times.

Unfortunately, during the period of submersion muddy water partly caused the decay of plants. This partial loss was later on aggravated by the damage done by the birds and fish and we could not get the expected yield. Thus, no other data except some height records were available. With the newly constructed improvised structure which will afford more controlled condition, we hope to get more information next year.

Correlation studies were made between the height of plants at the time of submergence and their growth rate below water. A brief summary of our observations is given below :—

TABLE II

(*Showing the values of correlation coefficients*)

Age of seedlings	Depths of submergence					
	6″		10″		14″	
	Observed	Expected at 5 per cent.	Observed	Expected at 5 per cent.	Observed	Expected at 5 per cent.
2 weeks ..	·67	between ·2875 and ·2732.	·54	between ·28 75 and ·27 32.	·49	between ·2875 and ·2732.
4 weeks ..	·60	Ditto	·61	Ditto	·52	Ditto.

It appears from the above table that for 2 and 4-week old seedlings there is an association between the initial height of the plants and their growth rate below water and this association pales with every increase in the depth of submergence.

3. *Histological studies.*— According to the recommendation of the Rice Sub-committee of the Imperial Council of Agricultural Research a considerable portion of our time during the year was utilized in studying the histology of deep water paddies.

Preliminary work on the development of sclerenchymatous tissue did not reveal any great difference among the pure lines of deep water paddies. This is particularly true during the periods of rapid growth which usually follows abrupt water-rises when all the pure lines show very slight development of sclerenchymatous tissues. Field observations have revealed that these paddies are very susceptible to uprooting from September onward if there is any rapid rise of water preceded by a fall. The additional buoyancy of plants often uproots them due to stems decaying at their base.

A very useful line of work that was pursued as a result of these studies was to explore the correlation (if there be any) between water-response of pure lines and the area of their air passages expressed in per cent. of the total area of cellular tissues.

Twenty pure lines had been studied for the last three years. Their growth rates during the period of flood were taken up for detailed study so that the height records, taken with greater frequency, could be utilized for providing necessary data.

The area covered by cellular tissues of a stem was found out by deducting the space occupied by the central hollow from the corresponding area of the transverse section. The total area of air passages in the same section was calculated from necessary dimensions read under the microscope and was expressed in terms of the percentage of the total area occupied by cellular tissues. Ten such estimations were made from the same stem of every pure line under study so that the average could indicate correctly the percentile area of air passages, characteristic to the pure line. Such percentile area was determined for 20 pure lines. Their growth rate was found out in a manner described before.

With a view to exploring the probability of any correlation between the percentile area of air passages in pure lines and their capacity to withstand flood, three different estimations of correlation coefficients were made, as shown below :—

TABLE III

(Showing the correlation between the growth rate of the pure lines and the percentile area of their air passages).

	Value of " r "	
	Observed	Expected at 5 per cent,
1st determination ...	·398	·4438
2nd " ...	·401	"
3rd " ...	·405	"

The above observed values of " r " do not show any real association between the water-response of pure lines and the percentile area of their air passages. Whatever little association is noticed is entirely due to chance fluctuation and not due to any real effect.

4. *Studies on border line effect.*—The study of alley effect on tillering, height and ear-length was incidentally carried out in three pure lines in each of *Boro* and *Tupa* and two in *Bashful*. The alleys were 2ft. wide in rows and 3ft. in columns, while the spacing was 1 foot between the plants. As all the pure lines were grown on one border line and an inner line all-round with a single plant in the centre, only the difference between the plants on the border line and those on the second line could be investigated. The following is a brief resume of our studies :—

TABLE IV

(Showing the alley-effect on tillering, height and ear-length in Boro

Types under observation	Tillers			Height			Ear-length		
	Mean number of tillers per plant		Probability	Mean height of plants		Probability	Mean ear-length in plants		Probability
	Border line	2nd line		Border line	2nd line		Border line	2nd line	
Boro									
B 24	23·0±·91	15·9±0·67	< ·001	128·4±1·5	127·8±2·2	Between ·9 and ·8.	20·15±0·39	20·56±0·33	Between ·5 and ·4.
B 25	41·7±4·13	21·3±1·85	< ·001	129·0±1·2	127·3±1·74	Between ·5 and ·4.	21·37±0·40	19·51±0·32	< ·01
B 122A ..	26·6±2·21	18·3±1·19	< ·01	107·4±·44	109·7±1·15	Between ·1 and ·05.	18·86±0·34	18·64±0·30	Between ·7 and ·6.
Bashful									
B 69	25·0±1·59	19·2±0·87	< ·02	153·3±2·6	152·5±2·73	Between ·9 and ·8.	26·78±0·51	23·43±0·68	< ·01
B 560	16·1±1·2	12·1±1·02	< ·05	126·5±2·66	124·9±2·47	Between ·7 and ·6.	22·2±0·68	21·5±0·51	Between ·5 and ·4
Tupa									
B 363	11·7±0·56	9·4±0·57	< ·02	103·6±2·24	104·3±1·23	Between ·8 and ·7.	22·9±0·14	20·9±0·81	< ·05
B 367	10·6±1·43	9·0±1·38	Between ·5 and ·3.	123·9±2·37	125·0±2·45	Between ·8 and ·7.	22·3±0·57	21·3±0·79	Between ·4 and ·3.
B 400	16·0±1·4	12·7±0·99	Between ·1 and ·05.	111·9±2·12	110·7±1·84	Between ·7 and ·6.	22·7±0·27	21·9±0·68	Between ·3 and ·2.

Tillering.—It appears from the above table that both in *Boro* and *Bashful*, there is a significant difference in the number of tillers among the plants on the border line and those on the second line. The level of significance is higher in *Boro* than in *Bashful.* These facts have been borne out by all the pure lines studied. In *Tupa,* though the plants on the border line were found to tiller more than those on the second line, the difference was not always statistically significant.

Height.—In all the three groups under study no significant difference in the mean height was noticed among the plants on the border line and those on the second line. This shows that the alley does not favour the height of *Boro* plants.

Ear-length.—Though a tendency of the plants on the border line towards the production of longer ears was noticed, still it was not statistically borne out in all cases. Out of the three cultures in each of *Boro* and *Tupa* and two in *Bashful*, only one in each group could show a significant difference in favour of the plants on the border line.

Summarising these results, it may be said that alley induces better tillering in *Boro* and *Bashful*. The effect of alley on ear-length is very feeble and occasionally perceptible. But it cannot cause any significant variation in the height of *Boro* plants.

IV.—Genetical Work

Boro paddies are mostly coarse grained. In order to obtain a fine grained spring paddy several crosses were made with some fine *Aus* paddies to combine the better grain-quality of *Aus* with the hardiness and high yield of *Boro*. The crosses in different generations are shown below :—

F —Cross I. *Boro* 70—107—15 × *Aus* 24—1 *Basantabahar.*

F_3—Crosses II and VII. *Aus* 45 *Charnak* × *Boro* 70—105—8 (Reciprocals).

F_3—Crosses III and IV. *Aus* 24—1 *Basantabahar* × *Boro* 135—113-16 (Reciprocals).

F_3—Crosses V and VI. *Boro* 70—105—8 × *Aus* 3 *Basmati* (Reciprocals).

These crosses were studied in F_3 and F_4 and selection of homozygous types with special reference to quality and yield was continued.

During the year under report the following two new crosses were made between *Boro* and *Sail.*

Cross VIII—*Boro* 78—4—11 × S. C. 54—60 *Vijoysail* (Kmj.)

Cross IX—*Boro* 78—4—11 × S. 61 *Prasadbhog* (Kmj.)

Some more crosses will be tried next year between the different groups of *Boro* paddy.

F GENERATION

Inheritance of the lemma and palea colour in the Boro paddy.—The colour of the lemma and palea in the majority of the *Boro* types is either straw or furrowed ; while in some cases it is gold or black, besides a few having mixed colours. Several crosses were made between *Aus* and *Boro* involving straw, gold and furrowed colours, the results of which are described below :—

I.—Straw × Furrowed

(*a*) *Crosses V and VI.*—These crosses were reciprocal between *Aus* 3 *Basmati* and *Boro* 70—105—8 with straw and furrowed colours respectively in lemma and palea. The F_1 was straw in colour and the F_2 segregated in the simple ratio of 3 straw : 1 furrowed. The F_3 behaviour of the 109 cultures grown during this year confirmed the F_2 ratio.

Nature of F_2 Parents	Segregations	F_3 frequencies Observed	F_3 frequencies Expected
63 straw ...	... Pure	18	21
	Segregating (3 : 1) ...	45	42
46 furrowed ...	... Pure	46	46

(*b*) *Crosses II and VII.*—These crosses were between *Aus* 45 *Charnak* and *Boro* 70—105—8 with straw and furrowed colours respectively in lemma and palea. The *Boro* parent was the same as in the previous cross and the F_1 also was straw coloured. But in F_2, they segragated differently in a ratio of 13 straw : 3 furrowed, on the basis of which the following behaviour was expected in F_3 :—

F_2	F_3
13 straw	7 all straw.
	4 13 straw : 3 furrowed.
	2 3 straw : 1 furrowed.
3 furrowed	2 3 furrowed : 1 straw.
	1 pure furrowed.

All the above segregations were realised in F_3, as shown in the following table:—

TABLE V

(*Showing the F_3 behaviour of the crosses II and VII*)

Nature of F_2 Parents	F^3 behaviour	F_3 frequencies Observed	F_3 frequencies Expected
82 straw	All straw	31	44·2
	13 straw : 3 furrowed }* 3 straw : 1 furrowed	51	37·8
32 furrowed	3 furrowed : 1 straw ...	15	21·3
	Pure furrowed ...	17	10·7

* The differentiation between these two segregates was not possible in the small number of plants raised in the F_3 cultures.

Although it is somewhat difficult in some cases to differentiate between a 13 : 3 and a 3 : 1 ratio except by proper breeding tests, the F_2 ratio can be justified by the behaviour of the furrowed plants, some of which bred true, while some segregated in the ratio of 3 furrowed : 1 straw, as expected on the basis of a 13 : 3 ratio.

II.—Gold × Furrowed

Crosses III and IV.—The crosses were between *Aus* 24—1 *Basantabahar* and *Boro* 135—113--16 with gold and furrowed colours respectively in lemma and palea. The F_1 was furrowed. In F_2, besides the two parental colours, two other colours—straw and light gold were also obtained. The segregations did not, however, conform to any of the Mendelian ratios. The F_3 data also were of no avail.

V.—Aman Field Experiments

Aman field experiments consisted of 4 cultural experiments and 8 varietal trials. All the experiments are being repeated every year with the same layout to assess the influence of season on the cultural practices and the types under our trial. This is particularly necessary in a crop like *Aman* which has to cope with different types of flood in different years.

Varietal trials.—Fifty-three types belonging to different groups based mostly on grain character and water-response were put under 8 varietal trials. Three types found very susceptible to the late flood in the previous year were rejected during the year under review. Except the varietal trial No.1, every trial comprised the promising types of a single commercial group. The selections of different groups were put under varietal trial 1 to test their relative merits.

As the year under review was one of very early and abrupt flood, all the types under our varietal trial had to pass a critical test. This has made the selection of flood-resistant types easier, specially when it has been decided that every type will have to pass a test of its flood-resistance even under the condition of artificial flood before it is finally recommended to the cultivators.

Varietal trial 1.—Six promising types of different groups were put under this trial. A summary of the results is given below :—

Summary of results, 1939

—	Types						General mean	Significance by 'Z' test	S. E. of difference	C. D. at 5 per cent.
	A 55-12	B 38-13	C 21-3	E 12-21	G 31-3	H 76-5				
Per cent. on mean ..	123·8	125·5	93·2	89·1	74·8	93·5	100	Yes	8·7	18·66
Yield in lbs. per acre ..	1914	1940	1,440	1,378	1,157	1,446	1,546	..	..	..

Conclusion—

1939 :—B A H C E G

1938 :—C G B A E D

It is interesting to note that our recommended strain 38-13 maintained its superiority even in a year of early and abrupt flood. A 55-12 has also shown greater flood resistance than most other types. The type 31-3 which gave high yield last year has failed to maintain its position this year.

Varietal trial 2.—In this experiment 5 types of *Lal Aman* group were tried. The result has been summarised below :—

Summary of results, 1939

—	Types					General mean	Significance by 'Z' test	S. E. of difference	C. D. at 5 per cent.
	A 151	B 129	C 39-2	D 178	E 31-3				
Per cent. on mean	102·2	104·2	106·3	91·2	96	100	yes	4·37	9·52
Yield in lbs. per acre.	1,932	1,970	2,010	1,724	1,815	1,890	..	..	..

Conclusion—

1939—C B A E D

1938—E B A C D

The superiority of the type 129 has been borne out in both the years. It will be tried further next year to test its suitability for multiplication on a field scale. As in the previous experiment, the type 31-3 has been found to be affected by flood. But in the year 1938 it gave high yield in both the experiments. Thus it may be said that the type 31-3 is a good yielder so long it is not affected by the early and abrupt flood. The positions of A 151 and A 178 are more or less the same in both the years.

As the experiment completed 3 years in the same field with the same lay-out, the analysis of the serial experiment evolved from the continued repetition of this varietal trial has also been made.

A brief summary of the results is given below :—

Primary effect for types

—	Types					General mean	Significance by 'Z' test	S. E. of difference	C. D. at 5 per cent.
	A 151	B 129	C 39-2	D 178	E 31-3				
Per cent. on mean.	101·4	104·8	98·5	93·2	101·8	100	Yes	2·35	4·80
Yield in lbs. per acre.	2,447	2,528	2,374	2,253	2,455	2,411	..	..	..

Conclusion B E A C D

A review of the results confirms the superiority of the type 129. Though A 31-3 has been adversely affected by the early and abrupt flood of this year, it is found to be a good yielder under the average condition of the season. As found in the years 1938 and 1939, the positions of the types 151 and 178 remain the same even when the average condition prevailing in three years under our study is taken into consideration.

Primary effect for seasons

	Seasons			General mean	Significance by 'Z' test	S. E. of difference	C. D. at 5 per cent.
—	S_1 1937	S_2 1938	S_3 1939				
Per cent. on mean	99·5	122·1	78·4	100	Yes	1·82	3·72
Yield in lbs. per acre.	2,398	2,945	1,890	2,411	..	..	..

Conclusion $S_2 > S_1 > S_3$

In assessing the influence of season on the types under this trial, the moisture content of the soil immediately before and after the sowing and the nature of water-rise during the rainy season should be the prime considerations. Reviewed in this light, the year 1938 could combine the advantage of sufficient rainfall before and after the sowing with a gradual water-rise. Consequently this year proved to be the most favourable for the types under our trial. In the year 1937 with a slower and lower water-rise, a dry spell followed the sowing. So the seeds sown could not germinate very satisfactorily. Thus the disadvantage of inadequate moisture-supply before and after the sowing could more than outdo the advantage of favourable water-rise. So the year 1937 has been ranked below its succeeding year. In the year 1939 the crop suffered from double disadvantage. A drought followed the sowing, resulting in poor germination. The situation was worsened by the advent of an early and abrupt flood.

From the above observations, it may be inferred that a good season for *Lal Aman* types under our trial is one that combines the benefit of sufficient moisture on the soil at the time of sowing with a gradual water-rise during the rainy season.

Seasons x Types

Per cent. on mean

—	Types A 151	B 129	C 39-2	D 178	E 31-3	General mean	Significance by 'Z' test	S. E. of difference	C. D. at 5 per cent.
S_1 (1937) ..	103·5	106·5	92·1	94·0	101·1				
S_2 (1938) ..	121·1	126·3	120·3	113·9	129·0	100	Yes	4·08	8·33
S_3 (1939) ..	80·0	81·7	83·3	71·6	75·3				

Conclusion—

A $S_2 > S_1 > S_3$ S_1 B A E D C

B $S_2 > S_1 > S_3$

C $S_2 > S_1 > S_3$ S_2 E B A C D

D $S_2 > S_1 > S_3$

E $S_2 > S_1 > S_3$ S_3 C B A E D

The year 1938 was more favourable for all the types than the year 1937 which again was better than the year 1939. These facts have been explained in the discussion of primary effects for seasons.

The type 178 has proved the worst in all the seasons studied. It is the lowest yielder even under the average condition of the season. The type 151 and 129 maintain their high positions uniformly. A 31-3 which gives high yield in a year of gradual water-rise is ranked among the lowest yielders when the water-rise is early and abrupt in nature. But under the average condition of the season it proves to be one of the highest yielders. Though the position of A 39-2 is very low in a normal year, it is less affected than most other types in a year of early and abrupt flood.

Varietal trial 3.—Four promising types of the *Khama* group, conspicuous for its capacity to withstand flood were put under this trial. A brief summary of the results is given below :—

Summary of results, 1939

—	Types A 249	Types B 55-5	Types C 27-4	Types D 49-2	General mean	Significance by 'Z' test	S. E. of difference	C. D. at 5 per cent.
Per cent. on mean	97·6	96·4	90·9	115·2	100	Yes	5·13	10·93
Yield in lbs. per acre	1,767	1,745	1,645	2,086	1,811	..	..	..

Conclusion—

1939 D A B C

1938 D A C B

It is noticed that the types 49-2 and 249 give uniformly high yield under different conditions of water-rise. The suitability of one of these two for multiplication on a field scale will be examined next year. Other types have failed to show any marked uniformity in their comparative positions in the varietal trial.

Varietal trial 4.—The number of *Katlaki* types under this trial has been reduced from 7 to 5. The two types that had been found to be very adversely affected by the late flood of the last year were rejected during the year under review.

The results have been summarised below :—

Summary of results, 1939

—	Types A 268	Types B 182	Types C 103-9	Types D 166	Types H 48-14	General mean	Significance by 'Z' test	S. E. of difference	C. D. at 5 per cent.
Per cent. on mean.	187·7	70·5	56·4	52·7	132·8	100	Yes	13·78	30·03
Yield in lbs. per acre.	1,794	674	539	503	1,269	956	..	..	..

Conclusion—

1939 A H B C D

1938 A C H D B

In both the years types 268 and 48-14 are outstanding in their yield and A 182 and A 166 have given low yield. The increase in the yield of A 268 over that of A 48-14 is significant this year, though their difference failed to show any significance last year. Thus the type 268 is expected to be a desirable one for multiplication on a field scale.

Varietal tiral 5.—In this experiment 10 promising types of the *Kala Aman* group were tried. A brief summary of the result is given below :—

Summary of results, 1939

—	Types										General mean	Significance by 'Z' test	S. E. of difference	C. D. at 5 per cent.
	A 53—6	B 262	C 21—3	D 263	E 264	F 63—1	G 78—22	H 21—7	I 29—1	J 79—10				
Per cent. on mean.	118·5	140·1	89·2	101·8	144·6	56·5	44·9	65	136·1	107·9	100	Yes	20·03	41·12
Yield in lbs. per acre.	1,616	1,911	1,217	1,389	1,973	770	612	887	1,856	1,471	1,364	..	..	..

Conclusion—

1939 E B I A J D C H F G

1938 C H I D B E J A F G

The results of the two years do not agree, perhaps, due to different nature of water-rise. But even through the apparent conflict, a uniformity in the behaviour of the type 29—1 can be noticed, as it has given high yield in both the years.

Varietal trial 6.—Five types of the *Gowai* group were put under this trial. The results have been summarized below :—

Summary of results, 1939

—	Types					General mean	Significance by 'Z' test	S. E. of difference	C. D. at 5 per cent.
	A 25—4	B 38—13	C 38—9	D 55—12	E 50—9				
Per cent. on mean	89·3	110·1	103·0	108·2	89·3	100	Yes	7·02	15·30
Yield in lbs. per acre	1,873	2,309	2,159	2,268	1,873	1,990	..	..	..

Conclusion—

1939 B D C A E

1938 E C B D A

As in the varietal trial 1, here also the superiority of the type 55—12 and our recommended strain 38—13 has been brought out. Though the type 50—9 gave the highest yield last year, it has proved the worst during the year under report indicating thereby its susceptibility to early and abrupt flood. The position of A 38—9 is more or less the same in both the years.

Varietal trial 7.—This experiment comprised 9 red kernelled *Laki* types. This is the third year of the experiment. The results of the last two years are given below :—

Summary of results, 1939

—	Types									General mean	Significance by 'Z' test	S. E. of difference	C.D. at 5 per cent.
	A 64—13	B 51—5—5	C 52—18	D 36—11	E 12—3	G 200	H 38—8	K 197	L 196				
Per cent. on mean ..	**130·8**	**151·6**	**140·3**	**111·7**	**87·3**	**44·1**	**133·2**	**42·1**	**69·1**	**100**	**Yes**	**8·6**	**17·95**
Yield in lbs. per acre ..	**2,173**	**2,520**	**2,332**	**1,856**	**1,451**	**733**	**2,209**	**700**	**982**	..	..	..	..

Conclusion—

1939 B C H A D E L G K

1938 B C D L H K A G E

A marked uniformity in the behaviour of the types 51-5-5 and 52-18 has been noticed for three years. They have proved to be best under different conditions of water-rise. Other types do not agree very much. This shows that their yield fluctuates considerably with the varying nature of water-rise.

Varietal trial 8.—Nine types of white kernelled *Laki* were put under this varietal trial. But the two types, A 102 and A 14-22, were totally submerged and gave deplorably low yield. So they have been omitted from the calculation. The performance of the other types is shown below :—

Summary of results, 1939

—	Types A 156	B 133	C 192	D 185	E 146	G 14—22	H 100	K 102	L 133	General mean	Significance by 'Z' test	S. E. of difference	C. D. at 5 per cent.
Per cent. on mean ..	5·75	114·0	88·1	114·6	116·1	..	104·9	..	104·9	100	Yes	6·75	14·18
Yield in lbs. per acre	961	1,906	1,472	1,914	1,940	..	1,753	..	1,753	1,671	..	..	..

Conclusion—1939 E D B H L E C A

1938 D C B L H E A

In both the years, the types 185 and 133 have given high yield. So they are expected to be high yielders under different conditions of water-rise. The suitability of either of these two for recommendation to the cultivators will be examined next year.

It has also been found that though our recommended strain A 192 gives very high yield in a normal year, it is somewhat adversely affected in a year of early and abrupt flood. This simply justifies our recommendation for its cultivation in the high-lying areas of deep water tracts.

Cultural experiment.—The number of cultural experiments continued to be four. Each of them is being conducted in the same field with the same lay-out to study the influence of season on the cultural practices under our trial. Individual experiments have been discussed separately.

Experiment on the best date of sowing.—In this experiment the effect of seven dates of sowing, once in every week from 6th April to 18th May was investigated. The results have been summarized below :—

Summary of results, 1939

—	Treatments							General mean	Significance by 'Z' test	S.E. of difference	C. D. at 5 per cent.
	A 6th April 1939	B 13th April 1939	C 20th April 1939	D 27th April 1939	E 4th May 1939	J 11th May 1939	H 18th May 1939				
Per cent. on mean ..	89·6	89·7	101·5	110·9	93·4	113·8	92·6	100	Yes	10·2	20·83
Yield in lbs. per acre.	1,387	1,517	1,570	1,711	1,445	1,760	1,433	1,548	..	..	..

Conclusion.—1939 J D C B E H A

1938 B C A D E J H

The results of the two years do not agree. Unlike the previous year, a tendency towards continued increase in yield with every advance in the time of sowing has been noticed this year except for the sowings on 4th and 18th May 1939. This progressive increase in yield is, perhaps, due to the increase in the moisture-supply with the advance of monsoon so that the germination could also improve progressively. The deviations noticed for the two sowings on the 4th and the 18th May may be accounted for the semi-wet condition of the soil on these days rendering the conditions unfavourable both for dry and wet sowings.

In the year 1938 the reverse tendency was noticed except for the 1st sowing which was preceded and followed by a dry spell detrimental to the proper germination of the seeds sown. This apparent anomaly noticed in the two years is, perhaps, due to the varying intervals between the sowings and the advent of flood.

In 1938 flood came earlier than in 1939, though the water-rise was more abrupt in the latter year. Higher yields, recorded for earlier sowings in the year 1938, may be due to the greater interval between the sowing and the arrival of flood. As the seedlings in the late sown plots could not attain the minimum age to combat successfully with the rising water, they were very adversely affected by the flood and consequently registered low yield. But in the year 1939, owing to comparatively late arrival of flood, even the seedlings in the late sown plots could gain sufficient age and hardiness to withstand water-rise almost equally as those in the earlier sown plots. So the advantage derived by the later sowings from the increase in the moisture-content of the soil with every advance in the time of sowing could manifest itself in the abrence of any formidable aggression of the flood on the younger seedlings. But in both the years, however, last sowing has proved to be the worst.

Summarizing these results, it may be said that the best time for *Aman* sowing must have the following requirements :—

(1) Sufficient moisture available in the soil at the time of sowing.

(II) Sufficient interval (preferably of 6 weeks) between the time of sowing sand the arrival of flood.

It may be mentioned here that one of the above two requirements can mask the influence of the other. It is not very unlikely that the duration of growth and maturity may complicate the picture. But this requires further investigation.

Seed rate experiment (dry sown)—In this experiment. seed rates of 60, 75, 90, 105 and 120 lbs. per acre on dry soils were compared.

A brief summary of the results is given below :—

Summary of results, 1939

—	Treatments					General mean	Significance by "Z" test	S.E. of difference
	A 60 lbs.	B 75 lbs.	C 90 lbs.	D 105lbs.	E 120lbs.			
Per cent. on mean	95·9	96·3	99·2	104·00	104·7	100	No	7·46
Yield in lbs. per acre	1,392	1,400	1,440	1,509	1,520	1,452		

Conclusion :—1939 E D C B A
1938 D C E A B

Though a tendency towards increased yield with every increase in the seed rate has been noticed in both the years, still in no year the difference among the treatments is statistically significant. Though a seed rate of 60 lbs per acre has been found to be as good as 120 lbs. still it is very risky to recommend the former. A slight excess from the minimum is always necessary to meet the unforeseen contingencies like the failure of germination, the devastation of flood and other calamities. Thus under average conditons of sowing and water-rise, a seed rate of 75-90 lbs. per acre may be recommended for dry sowing.

Seed rate experiment (wet sown).—The seed rates compared in this experiment were the same as those in the previous one. But in this case, the seeds were sown on wet and puddled soil. The results of the experiment for the last two years are indicated below:—

Summary of results, 1939

——	Treatments					General mean	Significance by 'Z' test	S. E. of difference
	A 60 lbs.	B 70 lbs.	C 90 lbs.	D 105 lbs.	E 120 lbs.			
Per cent. on mean.	83·4	100·2	100·2	103·2	113	100	No	10·52
Yield in lbs. per acre.	1,265	1,520	1,520	1,565	1,715	1,517	..	..

Conclusion.—

1939 E D C B A

1938 E C B D A

Here also the difference among the seed rates is not statistically significant in both the years, though the same tendency, as has been noticed in the previous experiment, is also visible here.

As the progressive increase in yield for every increse in the seed rate beyond 75 lbs. per acre (except 120 lbs. which may have been influenced by chance fluctuation) is not so high as it has been noticed in the previous experiment, a seed rate of 75 lbs. per acre may be recommended for wet sowing.

Factorial experiment combining seed rate with time of sowing.—In this experiment sowings with four seed rates, *viz.*, 60 lbs. 80 lbs., 100 lbs. and 120 lbs. per acre on three dates, *viz.*, 27th April, 7th May and 17th May were compared. The results are discussed below :—

In both the years the difference among the seed rates is insignificant, This simply confirms our previous finding that a seed rate, above 60 lbs. per acre, cannot cause any significant increase in yield. The interaction between the seed rate and the time of sowing is also insignificant in both the years. But the effect of different dates is significant in the two years. This shows that the influence of the time of sowing is so overwhelming that it manifests itself in combination with all the seed rates under our trial. The primary effect for the time of sowing is indicated below :—

Summary of results, 1939

——	Time of sowing			General mean	Significance by "Z" test	S. E. of difference	C. D. at 5 per cent.
	T1 27th Apl.	T2 7th May	T3 17th May				
Per cent. on mean	94·7	147·1	58·2	100	Yes	8·37	17·09
Yield in lbs. per acre.	1,260	1,957	774	1,330	..	..	..

Conclusion.—1939 T2 > T1 > T3

1938 $\overline{\text{T1 T2}}$ T3

In both the years, the sowing on the 17th May has proved to be the worst. Though there was no significant difference between the sowings on the 27th April and the 7th May in the year 1938, the first date has proved worse this year, perhaps, due to inadequate moisture-supply at the time of sowing. But even from the point of view of statistical judgment, it may be said that the sowing before the second week of May is the best for *Aman.*

VI. BORO FIELD EXPERIMENTS

Boro field experiments consisted of 5 varietal trials and 5 cultural experiments. In the varietal trials altogether 58 types were compared against different standards including one of our recommended strain, B 111-17. The cultural experiments involved the age of seedlings and the time of transplanting, different durations of rest to uprooted seedlings, different number of weedings, broadcasting and transplanting and also different seed rates in the seed-bed.

Varietal trials.—Each of these experiments is being repeated in the same field with the same lay-out to study the influence of season on the types under trial. Individual experiments have been discussed separately.

Varietal trial 1.—This is a perliminary varietal trial in which 16 *Boro* types were compared against the recommended strain, B 111-17. Due to the large number of types involved, the control was repeated 5 times. A brief summary of the results is given below :—

Summary of results, 1938-39

Serial No.	Types	Per cent. on mean	Per cent. on standard	Yield in lbs. per acre
1	7-84-16	98·2	100·2	2,810
2	124-41-23	100·7	102·7	2,880
3	16-70-17	93·1	95·0	2,661
4	109-80-16	111·9	114·3	3,202
5	10-119-23	85·1	86·9	2,435
6	127-4-8	100·1	102·1	2,862
7	127-19-20	93·7	94·9	2,659
8	107-103-15	102·8	104·9	2,941
9	18-89-17	92·2	94·0	2,635
10	87-11-10	101·9	103·9	2,914
11	90-14-20	111·7	113·9	3,194
12	42-55-17	115·0	117·4	3,290
13	148-28-11	95·1	97·1	2,720
14	123-57-22	117·2	119·6	3,351
15	5-80-15	105·9	108·1	3,028
16	70-105-8	85·4	87·4	2,443
Control	B 111-17	98·0	100	2,803
	General mean.	100	102·0	2,860
	Significance by "Z" test.	Yes	...	...
	S. E. of difference	8·38	...	...
	C. D. at 5 per cent.	16·76	...	...

Conclusion.—

1938-39 14, 12, 4, 11, 15, 8, 10, 2, 6, 1, Control, 13, 7, 3, 9, 16, 5

1937-38 4, 2, 11, 14, 9, 10, 3, 8, 1, 7, 15, Control, 6, 5, 13, 16, 12

Perhaps, owing to the large number of types under comparison, it has not been possible in many cases to observe any statistical difference among the yields. Still the following tendencies are noticeable :—

(I) The types 109-80-16, 90-14-20, 123-57-22, 87-11-10, 107-103-15, 5-80-15, 124-41-23 and 7-84-16 are promising to be better than the recommended strain, B 111-17. They will be tried further in a final varietal trial and the selection from amongst them is expected to replace the recommended strain.

(II) B 70-105-8, B 10-119-23 and B 148-28-11 have proved to be consistent low-yielders.

(III) All other types do not reveal much uniformity, showing thereby that their yields fluctuate very much with the varying climatic conditions.

Varietal trial 2.—This is also a preliminary varietal trial which tested 20 erect types against a local variety, *viz.*, *Bashful*. In this experiment the control was repeated six times for the accurate estimation of the standard with which the types were to be compared. The results have been summarized below :—

Summary of results, 1938-39

Serial No.	Types	Per cent. on mean	Per cent. on standard	Yield in lbs. per acre
1	43-111-17	92·4	88·9	3,011
2	89-15-15	88·1	84·7	2,872
3	136-113-9	94·6	91·1	3,085
4	78-4-11	88·4	85·1	2,883
5	128-69-21	91·1	87·6	2,968
6	95-24-10	102·0	98·1	3,326
7	125-107-20	89·9	86·5	2,931
8	56-110-23	103·5	99·5	3,374
9	97-82-21	109·4	105·3	3,566

Serial No.	Types	Per cent. on mean	Per cent. on standard	Yield in lbs. per acre
10	11-16-9	107·1	103·1	3,491
11	33-113-3	85·1	81·9	2,776
12	146-12-10	112·3	108·1	3,662
13	109-111-10	94·6	91·1	3,085
14	30-104-9	106·5	102·4	3,470
15	107-94-9	96·3	92·7	3,139
16	94-97-16	112·0	107·9	3,651
17	80-87-17	104·8	100·8	3,416
18	69-19-10	99·1	95·3	3,229
19	77-54-17	94·6	91·1	3,085
20	80-54-20	104·5	100·5	3,406
Control	*Bashful*	103·9	100	3,387
General mean		100	96·2	3,229
Significance by "Z" test.		Yes	...	...
S. E. of difference		8·5	...	...
C. D. at 5 per cent.		17·0	...	...

Conclusion—

1938-39 12, 16, 9, 10, 14, 17, 20, Control, 8, 6, 18, 15, 3, 13, 19, 1, 5, 7, 4, 2, 11

1937-38 16, 3, 14, 1, 10, 18, 6, 8, 12, Control, 17, 5, 13, 7, 4, 2, 11, 9, 20, 15, 19

Here also the difference among the types is not very well-marked. But the results tend to give the following indications :—

(I) The position of the control remains more or less the same in both the years.

(II) B 94-97-16, B 146-12-10, B 30-104-9 and B 11-16-9 are consistently giving higher yield than the standard. They will be tried next year in a final varietal trial.

(III) All other types are not very uniform in their yield. This is perhaps, due to the varying climatic conditions prevailing in the two years.

Varietal trial 3.—There were 8 types in this experiment with *Dholi Boro* a local white-kernelled variety as control. This is the third year of the experiment. The results of the last two years have been shown below:—

Summary of results, 1938-39

Serial No.	Types	Per cent. on mean.	Per cent. on standard.	Yield in lbs per acre.
1	109-36-14	102·5	105·9	2,910
2	30-23-16	101·1	104·5	2,870
3	90-2-8	102·7	106·2	2,915
4	70-42-9	90·7	93·7	2,572
5	120-43-22	100·7	104·1	2,859
6	102-15-21	96·2	99·4	2,728
7	102-65-17	101·7	105·2	2,887
8	90-30-14	106·5	110·1	3,023
Control	*Dholi Boro*	96·8	100	2,745
General mean		100	103·3	2,834
Significance by "Z" test.		Yes	...	...
S. E. of difference		4·14	...	...
C. D. at 5 per cent.		8·45	...	...

Conclusion—

1938-39 8, 3, 1, 7, 2, 5, Control, 6, 4

1937-38 5, 1, 8, 2, 3, 4, Control, 6, 7

The positions of B 120-43-22, B 90-30-14, B 30-23-16, B 109-36-14 and B 90-2-8 are more or less the same in both the years. Further it is noticed that some of our types are tending to be better than the local variety used as standard.

Varietaltrial 4.—In this experiment 8 types were compared against the recommended strain, B 111-17 as control. A brief summary of the results is given below :—

Summary of results, 1938-39

Serial No.	Types	Per cent. on mean	Per cent. on standard	Yield in lbs. per acre
1	126-114-18	110·9	133·3	2,420
2	16-45-11	116·6	140·2	2,545
3	4-71-22	98·9	118·9	2,159
4	15-8-28	97·5	117·2	2,127
5	126-113-10	101·3	121·8	2,211
6	121-33-19	100·3	120·7	2,190
7	12-39-20	89·6	107·6	1,953
8	109-37-22	101·9	122·6	2,224
Control	B 111-17	83·2	100	1,815
	General mean	100	120·2	2,182
	Significance by "Z" test.	Yes	...	...
	S. E. of difference	7·99	...	...
	C. D. at 5 per cent.	16·30	...	...

Conclusion—

1938-39 2, 1, 8, 5, 6, 3, 4, 7, Control

1937-38 1, 3, 2, 5, 4, 8, 7, Control, 6

In both the years almost all the types under trial have given better yield than the control, though the difference is not always statistically significant. Among these promising types, B 126-114-18, B 16-45-11 and B 126-113-10 are more or less consistent in their comparative yield.

Varietal trial 5.—Six *Tupa* types were put under this trial with a local *Tupa* as control. A brief summary of the results is given below:—

Summary of results, 1938-39

Serial No.	Types	Per cent. on mean.	Per cent. on standard.	Yield in lbs. per acre.
1	21-28-8	103·1	94·1	2,138
2	93-112-23	100·9	92·4	2,092
3	82-108-9	100·4	91·9	2,082
4	100-48-11	100·4	91·9	2,082
5	129-105-8	100	91·3	2,067
6	14-48-8	86	78·8	1,783
Control	Local *Tupa*	109·2	100	2,264
General mean		100	91·6	2,072
Significance by "Z" test.		No	...	...
S. E. of difference		8·59	...	...

Conclusion—

1938-39 Control, 1, 2, 3, 4, 5, 6

1937-38 5, 4, 3, Control, 1, 2, 6

Unlike the previous year, no significant difference has been noticed among the types this year. As *Tupa*, in general, is susceptible to drought, perhaps the dry spell at the pre-flowering stage has affected all the types under our trial and suppressed the normal expression of yield.

Cultural experiment.—The year under review was the 4th year of all the cultural experiments except for the experiment on weeding *versus* non-weeding which was a new introduction. Individual experiments have been discussed separately. The monetary return from the cultural practices under our trial has also been shown in cases where the latter demand an additional expenditure.

Factorial experiment combining age of seedlings with time of transplantation.— In this experiment the seedlings of different ages, *viz.*, 4, 5, and 6 weeks, were trarsplanted on four dates—28th December, 4th January, 11th January and 18th January. The results obtained in 1938-39 are discussed below.

As found from the beginning of this experiment, the primary effect for ages is insignificant this year also. It confirms the fact that the age of seedlings, beyond 4 weeks at the time of transplantation cannot influence the yield. Unlike the previous year, the interaction between the age of seedlings and the time of transplantation is not significant this year. But as in all other years, the primary effect for time is significant. A brief summary of the results is given below :—

Primary effect for time, 1938-39

	Treatments				General mean	Significance by 'Z' test.	S. E. of difference.	C.D. at 5 per cent.
	T_1 28th December	T_2 4th January	T_3 11th January	T_4 18th January				
Per cent on mean.	100·9	125·6	102·6	71·0	100	Yes	10·03	20·46
Yield in lbs. per acre.	1,965	2,447	2,000	1,383	1,949	..	..	..

Conclusion—

1938-39 T2 $\overline{\text{T3 T1}}$ T4

1937-38 $\overline{\text{T1 T2}}$ T3 T4

The difference between the transplantations on the 11th January and the 18th January is significant this year, though it was insignificant last year. This slight deviation, noticed in the two years, is due to the different character of seasons. We have already observed that in a year of deficient rainfall, specially at the pre-flowering stage of the *Boro* paddy, a significant difference is noticed between the transplantations on the 11th January and the 18th January. So the year 1938-39, with a rainfall of ·12″ in March, has revealed the aforesaid difference.

Unlike the previous year, the transplantation on the 28th December has proved worse than that on the 4th January this year. In may be accounted for the comparatively late recedence of water from the *Boro* field which rendered the conditions a bit unfavourable for the transplantation on the 28th December.

Experiment on different durations of rest to uprooted seedlings.—In this experiment uprooted seedlings were allowed rest for 0, 3, 6 and 9 days before transplanting in order to ascertain whether a resting period was beneficial. The results are summarized below :—

Summary of results, 1938-39

	Treatments				General mean	Significance by 'Z' test.	S.E. of difference.
	A Nil day	B 3 days	C 6 days	D 9 days			
Per cent. on mean ..	137·3	99·3	77·7	85·6	100	No	22·06
Yield in lbs. per acre ..	1,452	1,053	822	908	1,053	..	..

Conclusion—

1938-39 :—A $\overline{\text{B D C}}$

1937-38 :—$\overline{\text{C B A}}$ D

The difference among the treatments is insignificant this year. But as found in the previous year, 9 days' rest tended to produce a deleterious effect on yield this year also.

Experiment on the number of weedings.—This experiment was a new introduction. It compared the effects of 0, 1 and 2 weedings after transplantion. The results have been summarized below :—

Summary of results, 1938-39

	Treatments			General mean	Significance by 'Z' test.	S.E. of difference	C.D. at 5 per cent.
	A two weedings.	B one weeding.	C no weeding				
Per cent. on mean ..	113·2	99·1	97·7	100	Yes	3·5	8·1
Yield in lbs. per acre ..	1,957	1,714	1,516	1,729	..	..	..

Conclusion—

1938-39 :—A $>$ B $>$ C

The results show a continued increase in yield with every increase in the number of weedings, emphasizing thereby the need of weeding for a successful crop of *Boro*. It is further noticed that difference in yield between two weedings and one weeding is greater than that between one weeding and no weeding. Thus the efficacy of weeding increases with every increase in its number. This may be attributed to the fact that two weedings not

only lead to more complete eradication of weeds than one weeding but also give an extra interculture over the latter, as hand weeding practised in *Boro* fields combines interculture with the uprooting of weeds.

Judged from the economic point of view, it has been found that one weeding gives an extra profit of Re.1-4-0 per acre over no weeding, while with two weedings the profit swells upto Rs.4-12-0 per acre. The gain is expected to be higher when the cultivator employs himself and other members of his family in the work. With hired labourers the expenditures necessary for one and two weedings come to Rs.3-12-0 and Rs.6-4-0 per acre respectively. Thus a cultivator can derive the above profits of Re.1-4-0 and Rs.4-12-0 per acre for one and two weedings with the investment of Rs.3-12 and Rs.6-4-0 per acre respectively for 2½ months.

Though apparently a small profit has been recorded in favour of one weeding, still from the point of view of its far reaching beneficial effect on land, it has got an indispensable utility. In the absence of any weeding, weeds multiply in geometric progression and appreciably lower the yield of successive crops or even render the field unsuitable for cultivation. Thus no weeding has a disastrous repercussion on the land and its management and should be condemned.

Broadcasting versus *transplanting*.—In this experiment the effects of broad casting and transplanting were compared. This is the third year of the experiment. The results of the last two years are given below:—

Summary of results, 1938-39

	Transplanting	Broadcasting	General Mean	t.	
Per cent. on mean ..	109·5	90·4	100	observed	1·5
Yield in lbs. per acre ..	1,945	1,605	1,775	expected	2·57

Conclusion—

1938-39—Transplanting=Broadcasting

1937-38—Broadcasting=Transplanting

In this experiment no significant difference between the two treatments has yet been noticed, proving thereby that broadcasting early in December is as good as transplantation. But still transplantation is the usual practice in the *Boro* tracts. Perhaps, the monopoly of transplantation is due to the fact that water does not recede from the *Boro* field before the middle of December.

Even if broadcasting proves to be on a par with transplantation, still under normal circumstances, it may not be very economical to go in for the former, as the additional expenses for weeding very often swallow the saving of expenditure for transplantation. But broadcasting may be tried in the low lying *Aman* areas when the previous *Aman* crop fails due to flood or other calamities.

Experiment on different seed rates in the seed-bed.—This experiment tested the effects of different seed rates, *viz.*, 400 lbs. 560 lbs., and 720 lbs. per acre

in the seed bed. For all the treatments transplantation was done with single seedlings and with 9" spacing between the plants. The results have been summarized below :—

Summary of results, 1938-39

	Treatments			General mean	Significance by 'Z' test.	S. E. difference
	A 400 lbs. per acre	B 560 lbs. per acre	C 720 lbs. per acre			
Per cent. on mean ..	99·3	101·1	99·7	100	No	3·7
Yield in lbs. per acre ..	2,544	2,725	2,511	2,594	..	..

Conclusion—

1938-39— B C A

1937-38— A B C

Like the previous one, this experiment has also failed to show any significant difference among the treatments uptil now. Thus, from the point of view of yield a seed rate of 400 lbs is as good as 720 lbs. But still practical considerations create some difference among the treatments. The lowest seed rate, *viz.*, 400 lbs. per acre favours deep-rooting in the seed bed and consequently presents some difficulty in uprooting the seedlings. Again, the highest one (720 lbs per acre) produces weak seedlings which are very susceptible to damage at the time of transplantation. Thus, the intermediate dose, *viz.*, 560 lbs. per acre proves to be the best.

(*iii*)

Annual Report on Agricultural Marketing Survey, for the Year 1939-40

[L. K. Handique, B.Sc. (Agri.) (Edin), Senior Marketing Officer, Assam.]

Staff.—I was in charge of the Marketing Section of the Department of Agriculture, Assam throughout the year, except for the period from the 12th April to the 2nd October, 1939, when I was in charge of the Livestock Section, Babu N. K. Das, Assistant Marketing Officer (Crops), Assam was in charge of the Marketing Section. Maulavi Syed Madassir Ali, Agricultural Inspector, North Sylhet officiated as Assistant Marketing Officer (Crops) from the 1st June to the 3rd October 1939. Babu N. K. Das, Assistant Marketing Officer was on leave for one month and 15 days from the 2nd January 1940 and Maulavi Abdul Mobin Choudhury, Manager, Marketing Scheme was on leave from the 19th February to 28th March 1940. No substitutes were taken in their places for those short periods. There was no other change in the personnel of the Section.

Tours.—The following statement shows the number of days spent on tour by the officers of the Section :—

1. Mr. L. K. Handique, Senior Marketing Officer, Assam 36 days.
2. Babu N. K. Das, Assistant Marketing Officer, Assam ... 62 "
3. Maulavi Syed Madassir Ali, Officiating Assistant Marketing Officer, Assam. 60 "
4. Maulavi Md. Mashahid Ali, Assistant Marketing Officer, Assam, 115 "

Marketing Investigation :—Since the commencement of marketing survey in 1935, twenty-nine reports on the marketing of various commodities have been submitted to the Agricultural Marketing Adviser to the Government of India and the Director of Agriculture, Assam.

During the year under report, reports on Sugar and Lac were submitted. Besides these, a lot of supplementary information on the commodities reported on long ago had to be collected and supplied to the Agricultural Marketing Adviser to the Government of India.

Work in progress.—Marketing surveys on jute and cotton were being conducted. The investigation on cotton produced in the Hill Districts of Assam was taken up at the instance of His Excellency the Governor of Assam.

DEVELOPMENT WORK

1. *Fruit Marketing.*—During the year under report considerable attention was devoted to development work in marketing. With a view to expanding marketing facilities and saving the producers from the hands of middlemen the Scheme for marketing of Assam pineapples and oranges in Calcutta was started in the year 1938-39, as an experimental measure. The work was continued during the year, under many disadvantages. Still the result was on the whole quite satisfactory, as will be evident from the following statement showing the sale during 1939-40, of Assam pineapples, oranges, etc., in Calcutta through the Marketing Scheme.

Name of fruit	No. of packages	No. of fruits	Gross price	Incidental charges	Commission@6¼%	Net price
			Rs. a. p.	Rs. a p.	Rs. a. p.	Rs. a. p.
Pineapples ..	3,391	43,978	9,967 3 6	1,330 5 0	622 12 6	8,014 2 0
Oranges ..	4,081	3,59,133	5,684 0 3	457 2 6	355 6 3	4,871 7 6
Other Fruits	3	153	8 3 0	1 7 9	0 8 3	6 3 0
		Total..	15,659 6 9	1,788 15 3	978 11 0	12,891 12 6

A commission of Rs. 978-11-0, @ of 6¼ per cent., was charged for disposing of the fruits. Out of this Rs. 704-11-0 was paid to the agent engaged for the disposal of the fruits and the balance was paid in to the credit of the Department of Agriculture, Assam.

The appointment of an agent was found absolutely essential for copying with the pressure of work and for successfully competing with the Arathdars of Calcutta. In the absence of any Act for market control, the results obtained may be reasonably considered to be quite satisfactory. As many as 80 producers participated in the Scheme during the year under report. The work will be continued next year.

2. *Grading.*—The benefit of grading has not yet been realised by the growers or dealers of the province. Efforts were made before to start an egg grading centre at Shillong, but much success could not be achieved owing to the unwillingness of the dealers to bear even the cost of conveyance of their eggs to and from the centre arranged at a convenient place of the market.

Much success was, however, achieved during the year at the orange grading centre started at Gauhati. The fruits of the United Fruit Company, Limited, Gauhati were graded and disposed of in Calcutta through the Marketing Scheme. The following statement shows the result of grading :—

Name of fruit	Number of fruits	Gross price	Average price per 100 fruits
		Rs. a. p.	Rs. a. p.
Graded Oranges	17,944	375 3 0	2 1 6
Ungraded Oranges.. ..	3,41,189	5 308 13 3	1 9 0
Total ..	3,59,133	5,684 0 3	

Similar efforts will be made in future in other producing centres of the province. Demonstration on grading is considered to be essential even at the cost of public revenues for educating the producers and dealers.

Efforts will also be made to start an egg grading centre in Habiganj in the district of Sylhet and a grading station for mustard oil at Gauhati.

3. *Paddy Marketing and Regulated Jute Market.*—The scheme for marketing of paddy and the establishment of regulated jute markets in Assam submitted year before last, were under the consideration of the Government of Assam.

4. *Better Regulation of Markets and Standardisation of Weights.*—The drafts of (*i*) a bill to provide for the establishment and better regulation of markets dealing in agricultural produce in Assam and (*ii*) a bill similar to the Act passed by the Central Legislative Assembly to establish standards of weights and measures throughout British India were under compilation and both these draft bills would be submitted to the Government early next year.

5. *Propaganda.*—To promote the sale of genuine ghee the Agricultural Marketing Adviser to the Government of India has initiated a scheme for testing, grading and marking of pure ghee under the Agricultural Produce (Grading and Marking) Act, 1937. Considerable propaganda was done during the year under report for sale of the "*Agmark ghee*" and it is gratifying to note that sale increased considerably particularly in Tinsukia and Dibrugarh. Efforts will be made to introduce the same in other markets also.

6. *Examination of samples.*—A few samples of ghee were sent to the Central Ghee Control Laboratory at Cawnpore for analysis and the analytical results were satisfactory.

7. *Market news-service.*—Just after the commencement of the war arrangements were made to obtain weekly market prices of agricultural commodities from the important markets of the province, on payment, at the instance of the Agricultural Marketing Adviser to the Government of India. But the work was subsequently dropped due to want of funds and staff.

Monthly market prices of some of the commodities were being collected from different centres through the district staff of the Department of Agriculture, Assam, as usual.

8. *Miscellaneous.*—In addition to the work stated above, innumerable enquiries concerning market intelligence, data, statistics of export and import, facilities for improvement of marketing of different commodities, etc., were received from various Associations, Samities, Government officers, private individuals, companies, traders, etc., and information was supplied as far as possible. A large volume of correspondence was carried on with transporting agencies for obtaining concessional rates of freight for pineapples, oranges, etc.,

9. *Publication.*—Babu N. K. Das, Assistant Marketing Officer, prepared the following leaflets during the year under report :—

(1) Cultivation of pineapples.

(2) Menace of soil erosion in Assam (Jointly with the Director of Agriculture, Assam).

Commendation.—The work of the Marketing Section progressed quite up to the mark during the year although there was a number of changes in personnel. This satisfactory progress was due to additional work put in by all the officers, particularly by the Head Clerk, Babu Bimala Charan Chakravarty.

My grateful thanks are due to all the producers of pineapples and oranges who helped us in making the Scheme for marketing of pineapples and oranges a success, particularly to Rev. J. J. M. Nichols-Roy, M. L. A., through whose efforts the Scheme for grading of oranges has been successful ; and also to the District staff of the Department of Agriculture, Assam, for their help in obtaining various information on marketing.

(*IV*)

Annual Report of the Citrus Fruit Research Station, Burnihat, for the Year 1939-40

(S. Bhattacharyya, B. Ag., Horticultural Assistant, Citrus Fruit Research Station, Burnihat, Assam.)

This is the second annual report of the Citrus Research Station, Burnihat, which started functioning from September 1938. I continued to be in charge of the station throught the year. I was assisted in my work by a Field Assistant and a Grafter. Both the officers and the labourers suffered occasionally from malaria during the rains and I was hard put to in coping with the ever increasing work of the station. It is expected that with suitable anti-malarial measures, which are soon going to be adopted, the place will gradually become healthy.

Tour.—I was out on tour for a total number of 70 days for the collection of fruits, flowers, leaves, etc., of indigenous citrus, both wild and cultivated, and traversed on foot most of the southern portions of the Khasi and Jantia Hills and also visited some of the important citrus growing areas of the plains.

Rainfall.—The total rainfall during the year was only 48·65" against the normal precipitation of 60·70". Prolonged drought from February to April was responsible for reduced flowering and poor setting of fruits. The season was unfavourable for oranges throughout the province and the yield was almost half that of a normal year.

Construction.—During the year, the construction of the office, laboratory, go-down, staff quarters and the labour shed was completed. To effect economy, construction of the water works and fencing was taken up departmentally. The fencing of the whole area, totalling about 12,000 running feet, was completed.

Reclamation.—Clearing of jungles and levelling of land were done throughout the year. An embankment was put up around the experimental area so as to save it from inundation during the rains. The hill stream, running through the field, was deepened at places for better drainage.

Acquisition of Land.—During the year, 14 acres of plain land have been acquired for the station, of which 4 acres lie contiguous to the experimental area and the remaining 10 acres are situated on the bank of the river Afri at a distance of 3 miles from the station. Besides this, a bearing orange grove, containing 510 trees and situated close to the Burni river, has been purchased. There is now just enough land to accommodate all the experiments recommended by the Imperial Council of Agricultural Research.

General plantation.—After meeting the experimental needs, all the surplus land will be utilised for general plantation. Already 800 orange seedlings have been planted on the hill slopes. The plantation will be extended year after year till the whole of the hill slopes is covered by trees. Besides adding to the income of the station, the hill-side planting will afford us an interesting study on the behaviour of trees growing on different levels on the eastern, western, northern and southern slopes of the hills.

Collection and classification of citrus.—During the last fruiting season, 39 fresh samples were collected. So far 75 samples of fruits have been preserved in formalin for future studies. Sixty-six specimens of flowers have been collected from different parts of the province. These have been dried and preserved in the herbarium for identification. Fifty-three live specimens of citrus plants have been obtained and planted in the observation block. For the collection of wild citrus we have sought the help of the Forest Department and I am very much indebted to Mr. R. N. De, Botanical Forest Officer and Silvi-Culturist, Assam, for his help in this work.

Culture seedlings and the budded plants.—Altogether 111 cultures of the last year and 39 cultures of the current year were in the nursery. Measurements of growth in culture were being recorded systematically. A marked variation in growth was noticeable among culture plants. Of all the citrus fruits, lemons are usually the fastest in growth. The importance of a fully representative live collection of all the indigenous citrus varieties available in the province cannot be over-emphasised. Besides, adding to the knowledge of systematic botany on the subject, it will give us an opportunity to find out

some suitable stocks for the propagation of oranges both for the hills and plains. To study the relative compatibility of different citrus stocks for oranges, it has been decided to bud on all the different cultures with orange scions. the work on bulding has been carried out on a few varieties with interesting results.

Exotic varieties.—Though Assam has been growing oranges for *centuries*, no systematic attempt has so far been made to introduce exotic varieties *of citrus.* With a view to exploring the possibilities, attempts, are being to raise exotic budded plaints in large number for distribution amongst the orange growers. A beginning has already been made and about 5,000 stock plants have already been raised for propagation of Valencia, Washington novel, pomlo (grape fruit), Malta blood and Jaffa orange. The work will be extended over a number of years till all the exotic varieties have been given a fair trial in every representative citrus tract of the province. The exotic plants of the departmental orchard at Khanapara are now playing a very important role as parent trees for bud-wood.

Distribution of orange seedlings.—The practice followed in the province for raising orange seedlings has perhaps no other merit except cheapness of production. Usually all the damaged fruits, which cannot have any market are utilised for seed purpose without paying any attention to the bearing capacity quality of fruits and disease resistance of the parent trees. Steps were being taken during the year for raising seedlings from a few known trees in Chella and 6,000 orange seedlings of known parentage were raised. As there is a great demand for seedlings, these will be distributed among the growers.

Indigenous stock trial experiment—

Details of the experiment—

Varieties of stocks—5 (A, B, C, D, E)	Lay out—Randomised block
A = Shaddock (Rabab tenga)	
B = Khasi lime	Unit plot — 6 trees
C = Pani Jamir	Spacing — 15′×15′ ft.
D = Karun Jamir	Plot size — 45′×30′ ft.
E = Satkara	Replications — 4.

About 300 seedlings of each stock have been raised. Except Satkara, which is a very slow grower, the remaining stocks will be fit for budding next year.

Due to divergent soil and climatic conditions, obtaining in the provinces it has been decided to grow 4 budded plants of each of the afore-said stock, in different citrus tracts, for it is likely that a stock found suitable for one set of conditions may not necessarily be suitable for another.

Co-operative stock trial experiment—

Details of the experiment—

Varieties of root stocks—5 (A, B, C, D, E)	Lay out—Randomised blocks
A = Jambyri (Madras)	
B = Kichili (Madras)	Unit plot — 6 trees
C = Jathkhatta (Punjab)	Spacing — 20′×20′ ft.
D = Kharnakhatta (Punjab	Plot size — 60′×40′ ft.
E = Jamburi (Bombay)	Replications — 4.

During the year, all the root stocks were obtained from different provinces. The plants received from Madras are doing well, but those from the Punjab and Bombay have not as yet adapted themselves to the new environment. After continuous experimentation carried over a number of years these stocks have been adjudged to be the best in their home provinces. It will be interesting to watch their performance in Assam.

Manurial experiment with old bearing trees in a private garden at Mangaldai.—The plan of this experiment, given in last year's report, has been considerably modified and the new plan, supplied by the Statistician to Imperial Council Agricultural Research, is detailed below.

Treatments = (N, P, K, NK, KP, NKP, Control) × Lime Vs. no lime.

Number of trees per plot =6.
Spacing =12′ × 12′ ft.
Total number of plots =32
Total number of trees =424
Total area =1·04 acre.

The yield of each individual trees, including the guard rows, has been recorded and will be recorded again next year before the treatments are given. Due to the prevalance of drought, the yield was adversely affected. The variation in yield from tree to tree was also remarkable. On the basis of the yield *data*, for two consecutive years, the extent of variability from tree to tree will be statistically determined.

Manurial experiment with orange trees raised from seeds in the Citrus Station—

Treatments =(green manuring Vs. no green manuring) × (lime Vs. no lime) × N. P. K. with control.

Number of trees per plot =4
Spacing =20′ ft.
Total number of plots =32
Total number of trees including guard rows =324
Area required =2·8 acre.

The seedlings for this experiment have been raised from seed collected from a single heavy yielding tree. The seedlings are now one and a half year old and the average height of the plants is about 18″ inches.

Cultural experiment.—As stated in last year's report, a cultural experiment, designated as 'care' Vs. 'No care', has been laid out on Student's method in a private garden at Mangaldai. The yield of each individual tree has been recorded and will be recorded again next year. The *data* will be statistically examined. A precise record of the cost of each treatment will be maintained. This will indicate the economic posibility of adopting modern scientific methods of orchard management.

Insect pests.—Citrus leaf-miners (Phyllocnistis citrella, Staint) and lemon caterpillars (Papilio. Spp) were the only two pests of major importance that continued their attack on the citrus seedlings almost throughout the year. The caterpillars were controlled by had picking, but the leaf miners were practically beyond control even though the plants were frequently treated with tobacco decoction. A sporadic attack of termites was noticable in the culture seedlings and it was brought under control by treating the affected

places with kerosene oil emulsion. In the newly purchased orange grove, two trees were attacked by orange trunk borer (Monohammus versteegii). In one case the insect was killed by probing in with a piece of iron wire and in the other the hole was plugged with a cotton swab soaked in petrol.

Fungus diseases—

Yellowing of orange trees.—The disease is fairly common in the province, especially in the plains. The affected trees first manifest symptoms of the disease by developing irregular yellow spots on the leaves. The growth is severely affected and the branches begin to dry at the top. The disease usually occurs under two extreme conditions, *viz*., drought and water-logging, which mostly occur in higher altitudes and low-lying plains respectively. That the trees in higher altitudes suffer from a prolonged period of drought during the cold weather is well known. Hence, the popular belief among the Khasi cultivators that orange trees do best under shade. In low lying plantations the lack of proper drainage is probably the major cause for yellowing. It has been observed that the disease is altogether absent in river-side plantations where the land is silted by floods every year, but it is observed in trees which are situated a little away from the rivers above the flood level.

In order to test the validity of the above observations, 25 affected plants, obtained from the departmental orchard at Khanapara, were planted in a well drained plot at the Citrus Station. During a period of about eight weeks after planting, all the yellow leaves dropped down and the mottled ones gradually changed to normal green. The plants are now growing normally and no trace of yellow is present. The plants will be kept under close observation.

APPENDIX II

ANNUAL REPORT OF THE ECONOMIC BOTANIST, ASSAM, FOR THE YEAR 1939-40.

(H. K. Nandi, M.SC., Ph.D. (Lond.), F.L.S., F.R.M.S., Economic Botanist, Assam.)

Charge.—During the year under teport, I was in charge of the Botanical Chemical, Mycological and Entomological Sections. I was also in charge of the Titabar Paddy Research Station. Moreover, the Sugarcane Rasearch Scheme, partially financed by the Imperial Council of Agricultural Research, was under my control throughout this poriod.

Staff.—The staff employed consisted of one Farm Manager at the Titabar Paddy Research Station, one Botanical Assistant each at the Paddy Research Stations at Karimganj and Titabar, one Chemical Assistant for the Sugarcane Research Scheme, one Chemical Assistant, one Mycological Assistant and one Entomological Assistant at the Agricultural Research Laboratory, Jorhat.

Season.—The total rainfall at Karimganj was 129·98 inches, which was 33·72 inches less than the normal precipitation. The distribution of rainfall was quite seasonable until the heavy rainfall in July, which damaged the T3 planting the *sali* crop on the complex cultural experiment and the experiment of *sali* crop in the number of plaughings. The total rainfall at Titabar was 75·89 inches, against the normal precipitation of 70″. The rainfall was rather unseasonable. From the 4th October to the 23rd October there was not a single drop of rain and the crop suffered badly in consequence. The total rainfall at Jorhat was 73·93″ against the normal

rainfall of 83·62 inches. There was practically no rainfall during the months of November and December, 1939 and January, 1940, which markedly affected the growth of *rabi* crops and lowered their yield considerably.

Diseases and insect pests.—Among the different varieties of paddy grown at Karimganj, only *Latisali* was affected by Ripersin Sacchari, which was controlled by early removal of the damaged plants Cephalosporium damaged some plants of *asra* paddy. Rice bugs damaged the late transplanted *aus* at the Karimganj Farm to a certain extent

At Titabar Farm the attack of Cephalosporium was not visible on any paddy crops, which was rather unusual. Rice bugs appeared towards the end of July and damaged the late *aus* and early *sali*. Stem borers affected the paddy crop badly and it was noticed that only the fine varieties were attacked. The damage was estimated to be about 5 per cent.

The total percentage of diseased canes at the Jorhat Station came up to 11·7, out of which 8·8 per cent. was attacked by bacterial rot as against 4·2 per cent. of last year. Cercospora concors caused considerable damage to potato at the Titabar and Kokilamukh Farms. Wilt disease was noticed in the experimental cotton crop at Jorhat but the extent of damage was negligible.

Borers damaged the sugarcane crop at Jorhat as usual. The percentage of attack by Scirpophage was 41·4 and that by Argyria was 10·24 against 54·04 and 21·28 respectively of the previous year Removal of dead hearts and light trap operations gave good results in controlling the borers.

1. AGRICULTURAL BOTANY

Experiments and Research.—The experimental work and researches on paddy were continued, as before, at the Government Experimental Stations at Karimganj and Titabar, and consisted mainly of pure-line selection, hybridization and genetical studies, varietal trials, cultural and manurial experiments and miscellaneous experiments. Introduction, pure-line selection, genetical studies and varietal trials were also conducted at the Jorhat Experimental Station on pulses, oilseeds, tobacco and fibre crops. The following is a resume of the work done on agricultural botany at the paddy breeding stations at Karimganj and Titabar, and the botanical plots at the Jorhat Experimental Stations :—

1. KARIMGANJ STATION

A—Pure-line Selection

Altogether 50 new types of paddy were received during the year from Coimbatore, Ceylon, Central Provinces, Burma and British Guinea. Out of these 50 types, 6 belonged to *aus* and the rest to *sali*.

During the year under report, there were 983 types under observation, of which only 132 were grown in selected groups and studied carefully with regard to their respective yield, while the rest were continued in small plots only to maintain the pure-lines.

B—Varietal Trials

As in the previous year, varietal trials were conducted in two different stages, *viz.*, preliminary and final. In the preliminary stage a large number of types was compared by the incomplete block methods, while in the final stage a very limited number of types was compared either in Randomized

blocks or in Latin squares and the most up-to-date methods of calcutations were adopted to show the significance of difference between the types used Promising types of the preliminary trials were being included in the fina trial.

Four types (of which two are selections), *viz.*, D.204-1 in *dumai*, C.203-3 in *chengri* and two hybirds S.C.412-5 in *sail* and Ar.C. 614-25*b* in *asra*, have been found decidedly superior and have been recommended for the multiplication of seeds in the farm for distribution outside.

During the year under report, there were altogether 87 types under comparison of which 62 were in the preliminary trials and 25 in the final trials. Of these, 51 were cross-bred types and 36 pure-line types. The results of comparison are given below :—

(*a*) Preliminary trials :—

(*i*) Transplanted *aus*—

Varieties.—(1) As. 2, (2) As. 102-1, (3) As. 104-4, (4) As. 105, (5) As. 108-2, (6) As. 138-1, (7) As. 143, (8) As. C. 501-122*b*, (9) As. C.503-100 (10) As. C. 536-14, (11) As. C.536-140, (12) As C. 536-176, (13) As. s., 777-7, (14) As. C. 777-82*b*, (15) As. C. 777-105 *b*-1, (16) As. C. 869-140.

Arrangement.—Two dimentional quasi-factorial with two groups of sets.

Replications.—Four. Area harvested—6′ × 6′.

Two seedlings planted 6″ apart.

TABLE I

Analyses of variance

Due to	D.F.	S. S.	M. S.	F.	5 per cent.	Remarks
Blocks ..	15	198·3062	13·2204	335·5	2·09	Significant.
Varieties ..	15	1·3040	·0876	1·88	..	Insignificant.
Errors ..	33	1·5377	·0466	..	..	..
Total ..	63	201·1479				

The observed differences between the varieties are not statistically significant.

(*ii*) *Sail*—

Varieties.—(1) S. 22, (2) S. 540, (3) S. 565, (4) S. 597, (5) S-609-1*b* (6) S. 609-2, (7) S. 631, (8) S. 661-1, (9) S. C. 54-56, (10) S. C. 188-99*b* (11) S. C. 188-171, (12) S. C. 40-34, (13) S. C. 323-122, (14) S. C. 353 128, (15) S. C. 412-18, (16) S. C. 559, (17) S. C. 589-13*a*, (18) S. C. 638 22, (19) S. C. 638-26, (20) S. C. 638-34, (21) S. C. 671-22, (22) S. C.671 39, (23) S. C. 671-52, (24) S. C. 671-61, (25) S. C. 913-48*a*, (26) S. C 1177-26, (27) S. C. 1177-33, (28) S. C. 1177-36. (29) S. C. 1177-37, (30) S. C. 1177-44, (31) S. C. 1177-52 (32) S. C. 1177-56, (33) S. C. 1177-59, (34) S. C. 1177-61, (35) S. C. 1177-62, (36) S. C. 1177-64.

Arrangement.—Two dimensional quasi-factorial with two groups of sets.

Area harvested.—8′-3″ × 8′-3″

Replication.—Four. Two seedlings planted 9″ apart.

TABLE II

Analysis of variance

Due to	D.F.	S. S.	M. S.	F.	5 per cent.	Remarks
Varieties ..	35	4·3373	·1239	0·72	1·65	Not significant
Blocks ..	23	2431·6118	104·9439	609·43	1·65	..
Errors ..	85	14·6408	·1722	..	..	..
Total ..	143	2432·6899	..	..	..	..

The observed differences between the varieties are not statistically ignificant.

(iii) Asra—

Varieties—(1) Ar. 1, (2) Ar. 22-1, (3) Ar. 120, (4) Ar. 123-2, (5) Ar. 122-3, (6) Ar. 137, (7) Ar. 142, (8) Ar. C.615-19*a*, (9) Ar. C.615-24*a*. (10) Ar. C. 615-33*a*.

Arrangement.—Randomised blocks.

Replications.—Four. Area harvested 22′ × 6′.

Two seedlings planted 12″ apart.

TABLE III

Summary of results

Average yield	1	2	3	4	5	6	7	8	9	10	Mean
Pounds per plot.	6·19	6·81	6·00	7·02	7·54	6·40	7·30	6·96	6·51	6·91	6·76
Per cent on mean.	91·5	100·7	88·7	103·8	111·3	94·6	107·9	102·9	96·2	102·2	100

Average yield	S. E,	C. D.
Pound per plot	·30	·87
Per cent. on mean	4·44	12·86

5 7 4 8 10 2 9 6 1 3

Ar. 123-3 is at the top and has proved better than Ar. 1. Six types are equal to Ar. 1 Sail-badal and none of the varieties are found to be definitely inferior to Ar. 1.

(*b*) Final trials.

(*i*) *Early aus* (dumai).—The comparison of D.204-1 with D.138-6 has been continued for the third year.

Varieties.—(A) D.138-6, (B) D.204-1.

Arrangement.—ABBA. Replications—six.

Area harvested.—16·5′ × 8·5′ (1/311 acre).

Two seedlings planted 6″ apart.

TABLE IV

Summary of results

Yield		A	B	Mean diff.	S.E.	C. D. 5 per cent.
Pounds per plot...	...	5·61	6·27	·661	·245	·63
Pounds per acre...	...	1742	1947	205·3	76·09	195·7
Per cent. on standard	...	100·0	111·77	11·77	4·38	11·25

B > A

The type D.204-1 has proved definitely superior to D.138-6.

(*ii*) Medium *aus* (*murali and chengri*): –The experiment has been continued with the same six types as in the previous year.

Varieties.—(A) M.36-30 (standard), (B) M.182-1, (C).203-2, (D .203-3 (E) As. C.501-13*b*, (F) As.C.501-125*b*.

Arrangement.—Latin square (6×6).

Area harvested.—8·5' ×8·5' (1/603 area).

Two seedlings planted 6" apart.

TABLE V

Summary of results

Yield		A	B	C	D	E	F	Mean	S.E.	C.D.
Pounds per plot	..	4·07	3·93	4·07	3·99	3·69	3·44	3·86	·048	·142
Pounds per acre	..	2453	2370	2454	2406	2225	2074	2328	28·94	85·63
Per cent. on mean	..	105·7	101·8	105·7	103·4	95·6	90·0	100	1·24	3·70
Per cent. on standard	..	100	96·8	100	98·0	90·7	84·5	94·8	1·189	3·4

A=C=D=B > E > F

The type C.203-3 has proved its superiority for the last three years and is, therefore, recommended for field-scale trial in the general section.

(*iii*) *Transplanted* aus.—All the six types of the previous year have been continued in this trial.

Varieties.—(A) As. 2 (standard), (B) As. 85, (C) As. 93-2, (D) As. 101-2, (E) As. 144, (F) As. C.536-51.

Arrangement.—Latin square (6×6).

Area harvested.—8·5'×8·5' (1/603 acre).

Two seedlings planted 6″ apart.

TABLE VI

Summary of results

Yield	A	B	C	D	E	F	Mean	S.E.	C.D.
Pounds per plot	3·67	3·65	3·47	3·92	3·64	3·54	3·65	·1116	·34
Pounds per acre	2213·01	2200·95	2092·41	2363·76	2194·92	2134·62	2200·95	69·95	205·02
Per cent. on mean	100·5	100·00	95·1	107·4	99·7	97·0	100·00	3·17	9·31

D $\overline{\text{A B E F}}$ C.

Except the variety D, all the varieties gave indential yields.

(*iv*) *Sali*.—Five hybrid types were compared with *Lati-sali* as in the previous two years.

Varieties.—(A) S. 22 standard, (B) S. C.412-56, (C) S. C.638-32, (D) S. C.63856, (E) S. C.671-7, (F) S. C. 671-18.

Arrangement.—Randomised blocks.

Replications.—Six. Area harvested—63·75′ × 9′ (1/76 acre).

Two seedlings planted 9″ apart.

TABLE VII

Summary of results

Yield	A	B	C	D	E	F	Mean	S.E.	C.D.
Pounds per plot.. ..	34·82	36·36	34·69	37·64	36·93	33·33	35·63	0·98	2·85
Pounds per acre ..	2885	3012	2873	3117	3058	2760	2951	81·17	236·66
Per cent. on mean ..	97·8	102·1	97·4	105·6	103·6	93·5	100	2·75	7·99
Per cent. on standard ..	100·0	105·1	99·58	107·9	105·9	95·6	102·2	2·81	8·16

$\overline{\text{D E B}}$ A C F

Although there was no significant difference this year, the variety S.C.412-56 proved to be better than the standard, variety S. 22 Latisail in the previous two years. Hence this variety has been recommended and handed over to the general section for the multiplication of seeds.

(*V*) *Asra*.—In this trial also the same five types as in the last two years have been continued.

Varieties.—(A) As. 1 standard, (B) Ar. 116, (C) Ar. C.614-25*b*, (D) Ar. C.614-74*b*, (E) Ar. C. 615-2*b*.

Arrangement.—Latin square (5 × 5).

Area harvested 17′ × 17′ (1/150·73 acre).

Two seedlings planted 12″ apart.

TABLE VIII

Summary of results

Yield	A	B	C	D	E	Mean	S.E.	C.D.
Pounds per plot	14·17	13·60	19·41	16·91	16·37	16·11	·434	1·34
Pounds per acre	2136	2063	2926	2549	2467	2420	65·42	201·97
Per cent. on mean	88·0	85·0	120·8	105·0	101·6	100	2·69	8·61
Per cent, on standard ..	100·0	96·6	136·93	119·5	115·5	113·6	3·06	9·45

C > $\overline{\text{D E}}$ > $\overline{\text{A B}}$

This year too the hybrid Ar. C.614-25*b* is at the top. This variety is found to be definitely superior to the standard variety Ar. 1. Hence, the variety has been recommended and handed over to the general section for the multiplication of seeds.

C. Cultural Experiments

(*a*) Best age of seedlings in *aus* (2 factors).—

Varieties—(A) As. 2 Kasalath, (B) As. 3 Basmati.

Ages of seedlings—(*a*) 10 days, (*b*) 20 days, (*c*) 30 days, (*d*) 40 days.

Arrangement—Randomised blocks.

Replications—Four. Size of plots 31′×6′5′

Two seedlings planted 6″ apart.

TABLE IX

Summary of results

	A				B				
Yield	10 days	20 days	30 days	40 days	10 days	20 days	30 days	40 days	Mean
Pounds per plot	7·08	7·27	6·82	7·84	6·43	7·57	7·92	6·75	7·16
Pounds per acre	1569·21	1611·32	1511·56	1737·65	1425·12	1677·81	1755·38	1496·05	1586·94
Per cent. on mean	98·88	100·97	95·25	109·49	89·8	105·73	110·6	94·27	100·00

A=B, 20=30=40=10.

The observed differences due to age and varieties are not statistically significant.

(*b*) *Three-factor complex experiment in sail.*—A complex cultural experiment in *sail* with four times of planting, four ages of seedling and three numbers of seedling per hole is being continued for the second year in an area of 1·6 acres with 192 sub-plots as shown below :—

Times of planting—T_1—15th June, T_2—5th July, T_3—25th July, T_4—15th August.

Ages of seedlings—A_1—20 days, A_2—30 days, A_3—40 days, A_4—50 days.

Number of seedlings—N_1—2 seedlings, N_2—4 seedlings, N—6 seedlings.

Variety—S.22 Latisail.

The design of the experiment is of the split-plot type. The four dates of planting are whole-plot treatments and are arranged at random within each block. The twelve combinations of seedling, age and number of seedlings are sub-plot treatments which are thrown at random within each whole plot allotted to a date of planting.

The analysis of variance of grain yields is shown below :—

TABLE X

Analysis of variance

Variance due to	D. F.	S. S.	M. S.	F.	5 per cent.	Remarks
Blocks	3	27·56	9·18	...	...	
Times of planting (T).	3	478·07	159·36	13·76	3·86	Significant.
Error (1) ...	9	104·21	11·58	...	...	
Ages of seedlings (A).	3	70·43	23·48	26·68	2·68	Significant.
Number of seedlings (N).	2	8·26	4·13	4·69	3·07	Significant.
A×N	6	2·90	·48	...	...	
A×T	9	39·93	4·44	5·05	2·02	Significant.
N×T	6	4·60	·77	...	...	
A×N×T ...	18	18·14	1·01	1·15	1·83	
Error (II) ...	132	117·26	·88	...	...	
Total ...	191	871·36	...	...	...	

The heavy rainfall in July resulted in flood and damaged the T_3 plots. The significant effects were found at the following points :—

I. *Primary effects*.—All the primary effects were significant.

II. *First order interactions*.—Of the three first order interactions only one was significant, *viz*., between ages of seedlings and times of planting.

III. The second order interaction was inappreciable.

I.—Primary effects

(*i*) *Times of planting*.—The transplantation on the 15th June is as good as that on 5th July. Similarly, there is no difference in yield between the last two days of planting, *viz*., 25th July and 15th August. But there is a significant difference between the group of the first two dates and that of the second two. Transplantation after the 5th July reduced the yield considerably.

(*ii*) *Age of seedlings*.—The age of seedlings beyond 30 days did not increase the yield significantly.

(*iii*) *Number of seedlings*.—Transplantation with two seedlings per hole has proved to be the worst. There is no significant difference between the effects of 4 and 6 seedlings.

TABLE XI

Primary effects—Mean yield in pounds per plot

Times of planting	Ages of seedlings	Number of seedling
T_1—19·48 T_2—18·72 T_3—15·72 T_4—16·33	A_1—16·53 A_2—17·88 A_3—17·75 A_4—18·08	N_1—17·27 N_2—17·67 N_3—17·75
S.E.=·48 ; C.D.=1·54	S.E.=135 ; C.D.=·38	S.E.=·117 ; C.D.=·33
$\overline{T_1 T_2} > \underline{T_4 T_3}$	$\overline{A_4 A_2 A_3} > A_1$	$\overline{N_3 N_2} > N_1$

II.—First order interactions

(*i*) *Ages of seedling and times of planting.*—The effects of the four dates of transplantation as described before have been borne out by all the ages of seedlings. But with 40 days' old seedlings the tendency noticed in the primary effect for time is significantly manifest. Further, with a little reservation it may be stated that for early transplantation the ages of seedlings beyond 20 days cannot cause any significant difference in yield but for late transplantation older seedlings (preferably 40-50 days' old) are better.

TABLE XII

Mean yield in pounds per plot

—	T_1	T_2	T^3	T_4
A_1	19·13	18·39	14·03	14·59
A_2	19·63	19·09	16·43	16·36
A_3	19·48	18·28	16·01	17·23
A_4	19·69	19·12	16·40	17·13
S. E. = 0·27	C. D. = ·76			

A_1 : $\overline{T_1 \ T_2}$ $\overline{T_4 \ T_3}$

A_2 : $\overline{T_1 \ T_2}$ $\overline{T_3 \ T_4}$

A_3 : $T_1 \ T_2$ $T_4 \ T_3$

A_4 : $\overline{T_1 \ T_2}$ $\overline{T_4 \ T_3}$

T_1 : $\overline{A_4 \ A_2 \ A_3 \ A_1}$

T_2 : $\overline{A_4 \ A_2}$ $\underline{A_1 \ A_3}$

T_3 : $\overline{A_2 \ A_4 \ A_3 \ A_1}$ ($\underline{A_3}$)

T_4 : $A_3 \ A_4$ $A_2 \ A_1$

(*c*) *Winter* versus *Summer ploughing in* sail (*2 factors*).—

Varieties—(A) S.22 Latisail ; (B) S.156 Nagra Sail ; (C) S. C.94-47 Kerr Sail.

Ploughings—(*a*) Winter ploughing, (*b*) Summer ploughing.

Replications—Three. Area harvested—1/76 acre.

Two seedlings planted 9″ apart.

Half of the plots were ploughed up in winter just after the harvesting of *sail* paddy, that is in the latter part of January while the remaining plots were first opened up at the time of puddling in June.

TABLE XIII

Analysis of variance

Due to	D.F.	S.S.	M.S.	F.	5 per cent.	Remarks
Varieties	2	19·8852	9·9426	0·67	4·26	Insignificant.
Ploughings	1	·0050	·0050	00·00	5·12	Ditto.
Varieties × Ploughing ..	2	·4647	·2324	0·16	4·26	Ditto.
Blocks	2	295·6219	147·8110	10·52	4·26	Significant.
Errors	10	140·4796	14·05	..	..	
Total	17	456·4564	..	..	..	

Both the primary effects and the interaction between them are statistically insignificant. There was no difference in yield between winter and summer ploughing.

(*d*) Late transplanting in *sail*—

Varieties—(A) S.22, (B) S.156, (C) S.161, (D) S.C.54-60, (E) S.C 94-47.

Arrangement—Latin square (5×5)

Date of sowing—7th August 1939, date of transplanting 6th September 1939.

Area harvested—9′×5′·3″

TABLE XIV

Summary of results

Yield	A	B	C	D	E	Mean	S.E.	C.D.
Pounds per plot	2·99	1·75	2·47	3·24	3·17	2·72	·031	·10
Pounds per acre	2756	1613	2277	2987	2922	2511	28·62	92·32
Per cent. on mean	109·76	64·24	90·68	118·96	116·37	100·0	1·14	3·68
Per cent. on standard	100·0	58·53	82·62	108·38	106·02	91·11	1·04	3·35

$\overline{\text{D E}} > \text{A} > \text{C} > \text{B}$

D. Recommended Types *versus* Local Types :—

(*a*) Early and medium *aus*—

Varieties—(A) D.138-6, (B) C.148-1, (C) M.142, (D) M.36-30 (E) M.175-1, (F) Local.

Area harvested—1/580 acre.

Arrangement—Latin square (6×6).

TABLE XV

Summary of results

Yield	A	B	C	D	E	F	Mean	S.E.	C.D.
Pounds per plot ..	3·09	4·01	3·78	4·17	4·41	3·62	3·85	·092	·27
Pounds per acre ..	1792	2326	2192	2419	2558	2030	2233	53·36	156·6
Per cent. on mean ..	80·3	104·2	98·2	108·3	114·5	94·0	100·0	2·4	7·0
Per cent. on standard ..	100·0	129·8	122·3	135·0	142·7	117·2	124·6	2·98	8·74

E D B C F > A

Except the Variety D. 138-6, which belongs to *Dumai*, all the recommended varieties have been found decidedly superior to the local variety.

(*b*) Transplanted *aus*—

Varieties—(1) As.2, (2) As.3, (3) As.24-1, (4) As.46, (5) As. C.536 143, (6) Local.

Arrangement—Latin square (6×6).

The experiment was damaged by rice bugs and so it would be repeated next year to arrive at a definite conclusion.

(*c*) *Sail*—

Varieties—(1) S.22 Latisail, (2) S.61 Prasadbhog, (3) S.155 Badshabhog, (4) S.156 Nagrasail, (5) S.161 Dhepi Sail, (6) S.C.54-60, Vijoysail, (7) S.C.94-47 Kerr Sail, (8) S.C.671-16 hybrid, (9) Local.

Arrangement—Randomised blocks.

Replications—Six. Area harvested 8′ 3″×5′ 3″.

TABLE XVI

Summary of results

Yield	1	2	3	4	5	6	7	8	9	Mean	S.E.	C.D.
Pounds per plot	3·43	2·77	2·14	3·09	3·12	3·16	3·42	3·04	2·80	3·00	·12	·34
Pounds per acre	3196	2581	1994	2879	2907	2944	3186	2832	2609	2792	111·81	316·79
Per cent. on mean	114·5	92·8	71·4	103·1	104·1	105·4	110·5	101·4	93·4	100·0	4·0	11·33
Per cent. on standard ..	100	81·0	62·3	90·1	90·9	92·1	96·4	88·6	81·6	87·2	3·5	9·91

1 7 6 5 4 8 9 2 > 3

Both Lati Sail and Kerr Sail proved to be quite outstanding. Except Badshabhog, which is a finer type, none of the varieties is found to be inferior in yield to the local.

(*d*) *Asra.*—

Varieties—(A) Ar. 1, (B) Ar. 2, (C) Ar. 108-1, (D) Ar. C. 353-148, (E) Local.
Arrangement—Latin square (5×5).
Area harvested—17′×17′.

TABLE XVII

Summary of results

Yield	A	B	C	D	E	Mean	S.E.	C.D.
Pounds per plot	15·69	12·57	14·95	14·69	14·80	14·54	·417	1·28
Pounds per acre	2365	1895	2253	2214	2231	2192	62·85	192·93
Per cent. on mean	107·89	86·45	102·78	101·00	101·78	100	2·86	8·8
Per cent. on standard	100	80·13	95·27	93·61	94·34	92·68	2·65	8·15

A C E D > B

Except Ar. 2 Laki, which is a finer type, none of the recommended varieties is found to be inferior in yield to the local variety.

E. Hybridisation and Genetical Studies.—The cross breeding work at Karimganj Farm is progressing well. Besides the 4 recommended hybrid types, *viz.*, Kerr Sail, Vijoysail S. C. 671-16 in *sail* and Ar. C.353-148 in *asra*, two other hybrids, *viz.*, S.C.412-56 in *sail* and Ar. C.614-25 in *asra*, have been recommended this year. Some more promising hybrids have been selected and are being compared against the standard types.

There were altogether 8,256 hybrids under observation in different generations of which 311 were grown in selected groups and the rest being observed for their purity and other characters. In all 51 hybrids types were compared in the different classes of paddy of which 40 were in the preliminary trials and 11 in the final trials.

Inheritance of characters, such as, height of plants, white striped character, colour of the apiculus, stigma and awns, aroma in rice, size of grains, white striped and fully coloured and wild characters of Jhora grass, etc., were studied in the F , F_2, and F_3 generations.

The following is a review of the F_1 and F_2 studies.

(*a*) F_1 studies.

(*i*) Inheritance of the size of grains in *aus* :—

SIZE OF GRAINS

	Av. Length	Av. Breadth
As. 2.7·2 m. m.	... ...	2·4 m. m.
×		
As. 24-1·7·7 m. m.	... ...	1·7 m. m.
F_1—7·5 m. m.	... ...	2·2 m. m.

F_1—Was found to be intermediate.

(*ii*) Inheritance of height of plants in *aus* :—

		Av. height.
As. 2	... ...	130 c. m.
×		
As. 125	... ...	109 c.m.
F_1	... ...	144 c.m.

F_1 was found to be taller than the tall parent.

(*iii*) Inheritance of the white-striped and fully coloured characters in *sali* (S. 603×S. 670 :—

S. 603—All the vegetative parts as well as the floral parts were white striped.

S. 670—All the vegetative parts as well as the floral parts were purple in colour.

F —All the vegetative parts as well as the floral parts were purple in colour except outer glume which was whitish green.

N.B.—A peculiar plant was found in F_1 whose leaf sheath was pure yellow and white striped.

(*iv*) Inheritance of the wild characters in *sali* :—

(*a*) S. 565×Wild paddy.

(*b*) S. C. 54-60×Wild paddy.

F_1—In both the cases F_1 got all the characters of wild paddy, *viz.*, spreading, creeping and shattering habits.

(*v*) Inheritance of green and purple coloured characters in *sali* (S. 22× S. 670).—

—	Leaf sheath	Glumes	Lemma and Palea	Apiculus	Stigma
S. 22		Green	Green	Green	Green
S. 670	Green	Purple	Purple	Purple	Deep purple
F_1	Purple	Whitish green	Green	Purple	Deep purple

F_1 was found to be more or less intermediate in colour distribution.

(*vi*) Flowering character :—

	Date of flowering
As. c. 353-148	15th to 17th October
As. 108-1	3rd to 7th November
F_1	25th to 27th October

It was found to be intermediate.

(*b*) F_2—Studies—

(*i*) In 1938 a white striped strain S. 442-1 was crossed with a coloured strain S. 603. The F_1 was found coloured as expected. During the year under report 404 plants were studied in F_2. The following table will show the result.

(*a*) *Leaf sheath*

—	Purple	Green	Total
Observed	334	70	404
Expected (13 : 3)	328	76	404

X^2 = ·582. P = between ·8 to ·9

The fit is very good. But the ratio can only be confirmed by F_3 studies.

(*b*) *White striped character*

—	Purple	White striped	Green	Total
Observed	286	90	28	404
Expected (12 : 3 : 1) ...	303	75·75	25·25	404

X^2 = 3·914. P = between ·1 to ·2.

The fit is satisfactory. This shall have to be confirmed in F_3.

(*ii*) In 1938 two crosses were done, one S. 158-2 × S. 22 and the other S. 158-2 × S. 158-3, to study the colour of apiculus. Normally a coloured leaf-sheath is associated with coloured apiculus. This combination was, however, found to be absent in a peculiar type of paddy, S. 158-2, where the apiculus was green although the leaf-sheath was coloured. In order to study this cross-over character from all points this type was crossed with two others—one green S. 22 and another coloured S. 158-3. In each case the apiculus and stigma were coloured in F^1. The results of F_2 is summarised below :—

(*a*) *Apiculus*.—S. 158-2 × S. 22.

—	Green	Purple	Total
Observed	165	125	290
Expected (9 : 7)	163	127	290

X^2 = ·055. P = between ·8 to ·9.

The fit is very good.

Apiculus.—S. 158-2 × S. 158-3.

—	Purple	Green	Total
Observed...	191	122	313
Expected (9 : 7)	176	137	313

X = 2·92. P = between ·05 to ·1.

The fit is moderate. To confirm these two contradictory results these will be studied further in F_3.

(*b*) *Stigma*—S. 158-2 × S. 22.

—	Deep purple	White	Total
Observed	210	80	290
Expected (3 : 1)	217·5	72·5	290

X^2 = 1·033. P = ·3.

The fit is good.

The stigma of all the flowers of the cross S. 158-2 × S. 158-3 were found to be deep purple. These shall have to be studied in F_3.

(*iii*) As the inheritance of the colour of awns had not been studied properly here before, a cross was made between coloured awns S. 453 and non-coloured awns S. 455. In F_1 all the awns were coloured. It was observed that coloured awns were linked with the coloured apiculus. In F_2 275 plants were grown to study the segregation and the result was found as follows :—

Awns

—	Purple	White	Total
Observed	186	89	275
Expected (3 : 1)	206·25	68·75	275

X^2 = 7·96. P = below ·01.

The fit is not good. This requires further study in F_3.

(*iv*) To investigate the heritability of aroma and flavour in rice, a cross was made at this station to study the different aspects of the problem. S. 22, coarse and non-scented was crossed with S. 227-1, fine and scented. Aroma is generally associated with the fineness of the grains so far as the pure line types of paddy of the Surma Valley are concerned. In F_1 it was more or

less intermediate in size and fully scented. In F_2 316 plants were grown and the result is summarised as follows :—

Aroma—Parents	Size of grains	
—	Av. length in m. m.	Av. breadth in m. m.
S. 22 (Latisail non-scented) ...	8·6	3·46
S. 227-1 (Kalijira scented) ...	6·3	2·06
F_1—Scented	7·5	2·6
F_2—28 scented of	9·56 (Maximum)	3·0 (Maximum).
	5·8 (Minimum)	2·1 (Minimum).
Average 7·05		Average 2·48

—	Non-scented	Scented	Total
Observed	288	128	316
Expected (15 : 1)	296·25	19·75	316

$$X^2 = 3{\cdot}68. \quad P = {\cdot}05.$$

The fit is not good. It appears from the result of the cooking tests that the scent can be transferred by crossing over to coarse varieties. But to be more definite the result should be further observed in F_3 generation.

(*c*) Inheritance of height of plants in *Sali* :—

A cross was made between S.222 (tall) × S.663 (dwarf). The F_1 plants were more or less intermediate, inclining towards the dwarf parent. Four hundred ninty plants were studied in F_2. A simple ratio of 3 dwarf : 1 tall was obtained as reported last year. Ninty-three families, selected from different groups of height in F_2 were grown in F_3 in the year 1939, and the ratio was further confirmed in F_3 generation. The results, therefore, gave a clear indication of the monohybrid nature of the cross.

(*d*) New crosses :—

The following crosses were done during the year to study :—

(*i*) the inheritance of the number of grains in *sail* (S. 658 × S. 155),

(*ii*) the inheritance of the number of tillers in *sail* (S. 454 × S. 644),

(*iii*) the inheritance of the length of panicle in *sail* (S. 658 × S. 454), and

(*iv*) the inheritance of the size of grains in *sail* (S. 22 × S. 156).

F.—*Miscellaneous*

(*a*) *Seed testing.*—As usual the farm seeds which were to be sent outside were tested and the germination percentage was found to be quite satisfactory.

(*b*) *Cooking test.*—In order to study the inheritance of the aroma in rice in F_2 generations, cooking test was performed in the Jorhat Laboratory, the summary of which has been described under genetical studies.

2. *Titabar station*

The experimental work on paddy at Titabar was continued mainly under pure-line selection, cross-breeding and genetical studies, varietal and cultural experiments and miscellaneous experiments on the improvement of paddy.

A. Pure-line selection.—One hundred and forty new samples were collected from different rice stations of India and outside and grown for selection. There were 229 types of *ahu* and 793 types of *sali* under observation, of which 100 types of *ahu* and 150 types of *sali* were grown in selected groups and studied carefully with regard to their respective yield and other characters and the rest were continued to be grown in small plots only to maintain the pure lines.

Fifty varieties of *ahu* and 60 varieties of *sali* were studied qualitatively and quantitatively according to the special schedule of the Imperial Council of Agricultural Research.

During the year under review there were altogether 105 types under comparison in different groups of paddy, of which 80 were pure lines and 25 fixed hybrids.

In preliminary stages a large number of types was compared in small-sized plots while in final a limited number was compared in large plots. In all cases, the plots were arranged in randomised blocks and the up-to-date methods of lay-out and calculations were adopted to show the significant difference between the various types.

Selection trials

(*a*) *Ahu*—Selection experiment with 64 types of *ahu* was conducted after Yates' "Quasi-factorial design". Out of these, 7 types have been found better than the standard type As. 86. The experiment will be conducted for another year and the best types will be selected for inclusion in the preliminary varietal trials.

(*b*) *Sali*—Selection experiment with 49 types of *sali* was conducted after Yates' "Quasi-factorial design". Five types were found to be very promising and have been selected for further trial.

(ii) *Final varietal trial*

(*a*) *Ahu*—

Varieties—(A)—As.86 (standard) (B)—As.29, (C)—As.20/1, (D)—As.48 (E)—As. 11/2, (F)—A. C. 313/11.

Arrangements—Randomised blocks.
Replications—Six.
Size of sub-plots—$30\frac{1}{2}' \times 8\frac{1}{2}'$.
Planting—2 seedlings at 6″ apart.

Summary of results

Average yield	A As. 86	B As.29	As.20/1	D As. 48	E As.11/2	F A.C.313 /11	Mean	S.E.	C.D.
Lbs. per plot	10·5	13·16	14·0	12·75	5·5	9·67	10·93	0·64	1·9[illegible]
Ditto acre	1764·0	2210·88	2352·0	2142·0	924·0	1624·56	1836·24	107·52	312·[illegible]
Per cent. on mean	96·07	120·4	128·09	116·66	50·32	88·57	100·00	5·9	17·[illegible]

C. B. D. > A. F. > E.

C. B. D. are significant over our standard variety A—As. 86, F. is equal to A, but F has got an advantage over A (Rangadaria—our standard variety) having white kernal. Last year also C and D gave significantly higher yields over the standard type As. 86 (Rangadaria).

(*b*) *Sali*—

Varieties—(A)—S.C.307/473—2, (B)—S.3, (C)—S.C.308/210, (D)—S.C.308/372,

(E)—$\frac{S.}{J}$ 311, (F)—S.C. 308/51.

Arrangements—Randomised blocks.
Replications—6.
Size of sub-plots—$64\frac{1}{2}' \times 8\frac{1}{4}'$.
Planting—2 seedlings 9″ apart.

Summary of results

Average yield	A 307—473—2	B S. 3	C 308—210	D 308—372	E S. 311 / J	F 308—51	Mean	S. E.	C. D.
In lbs. per plot ..	22·5	25·3	29·16	32·33	33·00	33·66	29·32	1·22	3·55
Ditto acre ..	1900·80	2137·34	2463·44	2731·24	2787·84	2843·59	2476·95	103·06	299·[illegible]
Per cent. on mean ..	76·73	86·29	99·48	110·26	112·55	114·8	100·00	4·16	12·1

F. E. D. C. > B. > A.

The hybrid F and one of its parents E. (Lakhi joha)—our recommended variety—gave the highest yield. Two other hybrids, D and C of this combination, gave significantly higher yields over B and A.

B. Cross-breeding.—The cross-breeding work in this station has reached its 8th generation in *ahu* and 12th generation in *sali*. Some new crosses were tried during the year. Some fixed hybrids were found to be very promising. During the year under review there were 86 families of *ahu* and 120 families of *sali* crosses under observation from F_3 to F_{12}.

(*c*) *Cultural experiments*—

(*a*) Partial confounding experiment with 3 factors—

1. Spacing—3 (6″—9″—12″).

2. Seedling Nos. 3 (1—2—3).

3. Ages of seedlings—3 (1 month—1½ months and 2 months).

Replication—4.

Size of sub-plots—63′ × 6′ (1/155 acre).

Analysis of variance

Due to	Total sum of sqrs.	D. F.	M. S.	Ratio observed	Expected	Remarks
Blocks	299·74	11	27·25	3·32	2·10	Significant.
Age	66·00	2	33·00	4·02	3·15	,,
Spacings ...	80·00	2	40·18	4·90	3·15	,,
No. of seedlings...	50·68	2	25·34	3·09	3·15	Not significant.
A×S	12·53	4	3·13	0·38	2·52	,,
A×N	61·10	4	15·28	1·86	2·52	,,
N×S	5·94	4	1·49	0·18	2·52	,,
A×N×S ...	37·27	8	4·66	0·57	2·52	,,
Errors	573·87	70	8·2	...	...	
Total ...	1187·48	107	...	...	...	

Primary effects

Age	Mean yields in lbs.	Spacing	Mean yields in lbs.
4 weeks	23·08	6″	25·29
5 weeks	24·99	9″	23·48
6 weeks	24·15	12″	23·47

S. E.=·48. S. E.=·48

Age—Six weeks gave higher yield than 4 weeks, but identical with 8 weeks.

Spacing.—Highest yield was obtained in closest spacing at 6″ and the outturn was found to decrease when the spacing was increased to 9″ and 12″.

(*b*) *Water*—Level experiment with 2 factors—

Varieties—2 (A—Kerrsail, B—Vijoy sail).

Treatment—3 [0″ (moist)—3″ and 6″ water level).

Arrangements—4 randomised blocks.

Size of sub-plots—61″ × 9½″

Planting—3 seedlings at 9″ apart.

Summary of results

Variety	0″	3″	6″	Total
A ..	34·50	41·75	38·50	114·75
B ..	31·00	33·50	35·25	99·75
Total ..	65·03	75·25	73·75	..
Mean ..	32·75	37·62	36·40	..

Variety	Mean yield
A	38·25
B	33·25

S. E.=1·08. C. D.=3·25.

S. E.=1·33. C. D.=4·0.

3″, 6″ > 0″ A > B

Variety A is better than B, water level 3″ and 6″ both were significant over 0″. Variety A—Kerr sail—gave the best yield at 3″ whereas variety B gave the best at 6″.

(*c*) Seed-bed manurial experiment—

Variety—One, Prasadbhog.

Treatments—4 [Control, 200 mds., 400 mds. and 600 mds. per acre applied one week before sowing.]

Arrangements—4 Randomised blocks.

Area of sub-plots—20′ × 15′ feet.

Planting—2 seedlings at 9″ apart.

Summary of the result

Average yield	A Control	B 200 mds.	C 400 mds.	D 600 mds.	Mean	S. E.	C.D.
In lbs. per plot	20·4	20·9	20·9	19·6	20·45	0·5	2·56
Lbs. per acre	2962·08	3034·68	3034·68	2845·92	2969·34	116·16	371·71
Per cent. on mean ..	99·75	102·2	102·20	95·84	100·0	3·91	12·51

B. C. A. D.

All the three treatments gave similar results with control. Moreover, it was found difficult to uproot and plant the seedlings of 400 and 600 mds.

(*d*) Late transplanting in *sali*.—All the types of the previous year were continued to study the effect of late transplantation and select suitable types for late transplating.

Varieties—(A) $\frac{S.}{L}$—13, (B) S.126, (C) S.115, (D) $\frac{S.}{J}$— 311, (E) $\frac{S.}{L}$— 834/1, (F) $\frac{S.}{J}$—835/1.

Arrangement—Randomised blocks.

Replications—Five.

Area of sub-plot—8½′ × 19′.

Planting—4 seedlings at 6″ apart.

Date of transplanting—15th September.

Summary of the results

Average yield	A S.L.13	B S.126	C S.115	D S/J.311	E S.L.834-1	F S/J.835-1	Mean	S.E.	C.D.
In lbs. per plot ..	7.7	11·8	9·45	8·8	8·9	9·25	9·32	·51	[illegible]
Lbs. per acre ..	1856·84	3182·69	2518·85	2373·56	2399·50	2484·91	2503·79	137·55	[illegible]
Per cent. on mean	82·61	126·61	101·39	94·42	95·49	99·24	100·00	5·47	[illegible]

B > $\overline{\text{C F E}}$ $\overline{\text{D A}}$ B > C.F. > A

B. (S.126 Laudumra) gave the highest yield and was significant over the rest. C. (S.115 Latamaguri) and F (S/J. Badshabhog) were significant over A (S/L.13 Dhusari) which gave the poorest yield.

(*e*) *Maturity test with 2 factors—*

Varieties—4[A.—Badshabhog, B,—Bengalijoha, C—Latamaguri, D—Laudumra]

Dates of harvesting—4. H_1—4 weeks after flowering.
H_2—5 " " "
H_3—6 " " "
H_4—7 " " "

Arrangement— Randomised blocks.
Replications—Three.
Area of sub-plot—$19\frac{1}{4}' \times 14\frac{1}{4}'$.

Summary of the result

Varieties	Mean in yield in lbs. per plot	Harvesting date	Mean yield in lbs. per plot
A	17·54	H_1	17·33
B	18·29	H_2	19·80
C	19·13	H_3	19·92
D	21·42	H_4	19·33

S .E.=0·35, C.D.=1·02   S.E.=0·97, C.D.=3·36

D > $\overline{\text{C B}}$ $\overline{\text{A}}$ $H_3 = H_2 = H_4 H_1$.

The variety Laudumra gave highest outturn. All the harvestings at different dates gave equal outturns.

First order interaction :—

V X H. (*Mean yield in lbs. per plot*)

Dates of harvesting	Varieties A	B	C	D	
H_1	16·17	17·17	17·33	18·67	A: 6, 7, 4
H_2	15·67	18·67	21·17	23·67	B: 6, 5, [illegible]
H_3	20·00	20·00	19·00	20·67	C: 5,> 6, [illegible]
H_4	18·33	16·33	19·00	22·67	D: 5, 7, [illegible]

S.E. =0·7 C.D. [illegible]

All the varieties gave poor outturn when harvested at 4 weeks after flowering. In case of finer varieties (A and B) 6 weeks gave the best yield and in case of coarse varieties (C and D) 5 weeks was the best.

(*f*) Top cutting experiment—2 factors—

Varieties—2[A—Latamaguri, B—Dhalabadal.]

Treatment—3 (No cutting—one cutting and 2 cuttings)

Arrangements— Randomised blocks.

Replications—Six.

Size of sub-plots—30′ × 20′ each.

Planting—2 seedlings 1′ apart and planted on 27th June 1939.

Date of 1st cutting—18th August 1930.

Date of 2nd cutting—25th September 1939.

Summary of the result of grains in lbs.

Variety	(0) No cutting	(1) One cutting	(2) Two cutting	Total	Averages	
A	44·0	48·3	42·0	134·3	44·8	S.E=1·8
B	51·3	51·0	50·0	152·3	50·8	C.D.=5·24
Averages	47·6	49·6	46·0			B> A

S.E.=2·24 C.D.=6·5 1=0=2.

—	A			B			Remarks
	No cutting	One cutting	Two cutting	No cutting	One cutting	Two cutting	
Average yield of green fodder per plot in lbs.	..	30·75	60·8	..	28·0	60·4	
Do. per acre	..	2232·0	4414·0	..	2032·0	4385·0	;

Variety—B. Dhalabadal (*asra*) is better than the variety A—Lata maguri (*sali*) in grain yield. No difference was observed between the different cuttings. Regarding green fodder, both the varieties gave equal outturns in different cuttings. In the first cutting, outturn of green fodder was 2,132 lbs. per acre whereas the 2nd cutting gave 4,399 lbs. per acre. Considering both grain and fodder it seems two cuttings had a greater advantage, giving equal amount of grain and more fodder.

(*g*) Local *vs.* Recommended varieties trial.—

Varieties.—4 { Local—2 (A—Kolasali, B—Mathanga). Recommended—2 (C—Laudumra, D—Latamaguri)—

Arrangements—Latin square.

Size of sub-plots—15′ × 15′

Planting—2 seedlings at 9″ apart.

Summary of the result

Average yield in lb.	A Kolasali	B Mathanga	C Laudumra	D Latamaguri	Mean	S. E.	C. D.	Remarks
Per plot ..	11·0	11·5	14·25	12·75	12·4	03·95	1·37	
Per acre ..	2129·6	2326·4	2758·8	2468·4	2400·64	76·47	265·23	
Per cent. on mean	88·7	92·74	114·92	102·82	100·0	3·18	11·05	

C > D $\overline{\text{B A}}$
D > A

Our recommendation variety C.—Laudumra—gave the highest yield. Latamaguri though equal to the local variety " Mathanga " was significant over A—Kolasali, the most popular local variety.

D.—Genetical Investigations

(*a*) *Inheritance of flowering character and size of the grain*—Inheritance of flowering character and size of the grain of a cross between Basmati and Rangadaria (No.400) was studied during the year. The F_1 was more or less intermediate both in flowering character and size. The behaviour of F_2 will be studied next year.

(*b*) *Inheritance innerglume character in paddy*—In 1937, S. J.620 of yellow colour was crossed with S.1. of brown colour. F_1 was brownish. In F_2 they segregated in the ratio of 3 yellow : 1 brown. The F_3 results confirmed F_2 ratio obtained last year.

In F_3, 20 families were raised. The details of segregation are given below.

	Yellow	Brown	Total
Observed	578	207	785
Expected (3 : 1)	588·75	196·25	785
	9·25	10·75	

X^2 = ·735. P is between ·5 and ·3

The fit is satisfactory.

(*c*) *Inheritance of kernel colour in paddy*—In 1937, As. 75 Kathiamaya Ahu of red kernel was crossed with As. 77-2 Sariah Ahu of white kernel. The F_1 was red. In F_2 they segregated in the ratio of 3 red : 1 white. The F_3 also showed a ratio of 3 red : 1 white, thus confirming the results of F_2.

In F_3, 15 families were raised. The details of segregation are given below.

	Red	White	Total
Observed	366	132	498
Expected (3 : 1)	373·5	124·5	498
	7·5	7·5	

X^2 = ·6. P is between ·5 and ·3

The fit is quite good.

(*d*) *New Crosses*—Some new crosses were made to study the height, tiller numbers, grains and hybrid vigour in *sali* and *ahu*.

E. *Miscellaneous Experiments*

(*a*) *Seed testing*—As usual farm seeds which were to be sent outside were tested and the germination percentage was found to be satisfactory.

(*b*) *Sterility in rice*.—Sterility percentage of 200 types of *ahu* and 60 types of *sali* were counted during the year under review. It was observed that *ahu* had higher percentage of false grains than *sali*.

(*c*) *Milling quality*—Four varieties of *sali* paddy were taken up to see the effect of milling on the varieties when harvested at 4 different dates. It has been observed that finer varieties (Bengali joha and Badshabhog) have better milling percentage than the two coarse varieties. Harvesting at 4 weeks after flowering has given the poorest outturn and 6 and 7 weeks gave the best result when milled raw.

Result

Name of Varieties	Number of days from flowering to harvesting		Whole grain	Broken grain	Small broken particles	Husk	Milling loss	Total quantity of paddy	Remarks
			Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	
Laudumra ..	4	weeks	13	13·0	1·0	13·0	1·0	41	
Ditto ..	5	Ditto	13·5	13·0	0·5	12·0	2·0	41	
Ditto ..	6	Ditto	14·0	14·0	0·5	12·0	0·5	41	
Ditto ..	7	Ditto	14·0	14·0	0·5	12·0	0·5	41	
Latamaguri	4	Ditto	9·5	12·25	1·25	16·5	1·5	41	
Ditto ..	5	Ditto	10·5	14·50	0·5	15·25	0·25	41	
Ditto ..	6	Ditto	12·0	12·75	1·75	14.0	0·5	41	
Ditto ..	7	Ditto	12·0	13·50	1·5	14·0	..	41	
Bengalijoha	4	Ditto	13·25	8·0	3·25	16·0	0·5	41	
Ditto ..	5	Ditto	21.75	3·0	2·50	13·5	0·25	41	
Ditto ..	6	Ditto	24·0	1·75	1.50	13·0	0·75	41	
Ditto ..	7	Ditto	22·75	2·75	1·75	13·5	0·25	41	
Badshabhog..	4	Ditto	21·50	0·25	3·25	15·5	0·5	41	
Ditto ..	5	Ditto	22·0	1·0	3·25	15·5	0·25	41	
Ditto ..	6	Ditto	22·75	0·75	2·5	14·0	1·0	41	
Ditto ..	7	Ditto	23·50	0·75	2·5	13·0	1·25	41	

(*d*) *The study of the insect pest and disease resistance in paddy*—Badshabhog the finest variety, was affected by stem-borers badly. The affected plants were removed and the caterpillars were killed. It appeared that finer varieties were more susceptible to the attack of stem-borers than the coarse varieties.

There was no attack of disease during the year.

3. *Jorhat Station*

A. *Linseed*—Sixteen types of linseed selected last year were grown for further observation. They bred true to types with regard to (1) branching habit, (2) maturity, (3) colour of flowers, (4) size and colour of seeds. Further critical studies were made with regard to the economic characters and the number of types has been reduced to 12. A preliminary trial with 12 types will be made next year to compare the merits of the selected types.

(*a*) *Experiment on depth of sowing*—The usual method of sowing linseed here is broadcasting. When linseed was sown by this method it was observed that the percentage of germination was very poor. This naturally

suggested that either the seeds sown were of low viability or the depth of sowing was not correct. Germination test revealed that the viability of seeds was quite high and the method of sowing was wrong. In order to determine the proper depth of sowing an experiment was started to study the effect of different depths of sowing on germination.

Two varieties, *viz.*, Pusa 121 and T. T. B. 1, were grown in plots 30′ × 16′, at 1″, 2″ and 4″ depths.

TABLE I

Effect of different depths of sowing on germination

Variety	Per cent. of germination		
	1″ depth	2″ depth	4″ depth
Pusa 121	76 per cent.	81 per cent.	42 per cent.
T. T. B. 1	81 ,,	85 ,,	44 ,,

It will be evident from the Table I that 2″ depth is the best and 4″ depth is the worst. Further experiments will be done next year for confirmatory result.

(*b*) *Varietal trial*—A yield trial with 3 Pusa types, *viz.*, P. 121, P. 124 and P. 12, were compared with T. T. B. 1 (Local). The usual randomised block method was adopted.

Varieties — 4.

Arrangement — Randomised blocks.

Replication — Six.

Area of sub-plots — 45′ × 15′.

TABLE II

Summary of results

Yield	T.T.B. 1	P.12	P.121	P.124	Mean	S.E.	C.D.
Pounds per plot ..	8·0	10·0	8·3	7·5	8·45	·7	2·11
Pounds per acre ..	516·0	645·0	535·35	483·75	545·0	43·15	136·0
Per cent. on mean ..	94·67	118·34	98·22	88·75	100·0	8·0	24·11

P. 12, <u>P. 121, T. T. B. 1,</u> P. 124.

P. 12 gave the highest yield and P. 124 the lowest. The other two varieties, *viz.*, P. 121 and T. T. B. 1, gave almost identical yield.

B. Potato

(*a*) *Date of planting*—An experiment was taken up to determine the best time of sowing potatoes. Owing to the difficulty of getting potato tubers timely the first planting which had to be done by October was delayed by a month. The planting, therefore, started on the 18th November and continued upto the 19th January at intervals of about three weeks. It was observed that the first planting on the 18th November and the fourth planting on the 19th January gave the highest yields. Another interesting feature was that the plants of the fourth planting were not damaged by late blight.

More elaborate experiments with early, medium and late varieties will be taken up next year.

(*b*) *Whole* vs. *cut tubers*—A preliminary experiment was done to compare the yield of whole *vs.* cut tubers. The potato tubers were cut in such a way that each half had a strong sprout on it. The plants from cut tubers grew quicker and were more vigorous than plants from whole tubers. There was no significant difference in yield from the two. The economic advantage in the saving of quantity of seed potato from the use of cut tubers is however very great.

(*c*) *Cross-breeding work*—Studies were made on the flowering, fertility and sterility of a few varieties of potatoes. Strong healthy plants of the varieties *Patnai* and *Darjeeling* were selected for crossing. Under the climatic conditions in the plains the potato flowers were found to open between 10 a.m. to 12 noon in sunny days. The majority of anothers were found to start dehiscing between 12 noon and 1 p.m. The proper stage of emasculation is usually about 20 hours before the buds normally open.

One hundred crosses were made, of which 65 developed into fully-formed berries. The seeds from these berries have been collected for F_1 studies.

(*d*) *Storage experiment*—An observation was made on the keeping quality of mature and immature tubers of different varieties. A remarkable difference in the keeping quality was found amongst the different varieties. It was further observed that mature tubers keep better than immature tubers.

(*e*) *Experiment on hastening the sprouting of tubers*—Potato has a resting period of about 2 months or more. Sometimes the Shillong potato, which is harvested by August September, is sent to the plains for seed purposes to be grown as *rabi* crop. The potato growers often complain that the Shillong potato takes a longer time to sprout and consequently the crop is delayed and sometimes unsprouted tubers sown rot in the field. Some preliminary experiments were, therefore, carried out to devise means by which the resting period may be shortened so that it may be of some value to the growers in getting a normal crop. A short summary of the results is given below.

(*i*) *Effect of peeling the skin*—Potatoes harvested on 29th December 1939 and planted on 3rd January 1940. Number of tubers 20 in each lot.

TABLE I

Tubers planted on	Skin	Per cent. of sprout after				
		7th day	14th day	21st day	28th day	35th day
Sand (dry)	on	0	0	0	0	0
Sand (dry)	off	5	30	55	70	Drying
Sand (wet)	off	50	75	95	Rotting	..
Sawdust (wet) ..	off	70	85	100	Rotting	..
Sawdust (wet) ..	on	5	15	30	45	Rotting

The result of this treatment shows that peeled tubers planted in wet sawdust give a quicker and higher percentage of sprouting compared to wet sand. This is probably due to more moisture retaining capacity of sawdust. The rate of sprouting of peeled tubers in dry condition is much lowe than in wet condition. Again unpeeled tubers kept in wet condition were found to sprout. Tubers kept in dry condition did not sprout at all.

(ii) *Effect of cutting tubers in half*.—Potato harvested on 29th December 1939 and planted on 3rd January 1940. Number of tubers 20 in each lot.

TABLE II

Tubers planted on	Per cent. of sprout after				
	7th day	14th day	21st day	28th day	35th day
Sawdust (dry)	0	0	10	25	45
Sawdust (wet)	40	55	70	85	Rotting

It is evident from the result that cutting of tubers under both the conditions helps in sprouting, the rate being much higher in moist condition.

(iii) *Effect of diffused sunlight*.—Potato harvested on 29th December 1939. Exposed to sunlight for 5 days when they became green. Planted on 4th January 1940. Number of tubers 20 in each lot.

TABLE III

Tubers planted on	Treatment	Per cent. of sprout after				
		7th day	14th day	21st day	28th day	35th day
Sawdust (dry) ..	Greened ..	10	20	45	60	65
Sawdust (dry) ..	Ungreened	0	0	0	0	[illegible]
Sawdust (wet) ..	Greened ..	40	70	85	90	95
Sawdust (wet) ..	Ungreened	0	0	0	0	[illegible]

The result shows that tubers greened with diffused sunlight when kept under moist condition gives a higher rate of sprouting than when kept dry. There is practically no sprouting with ungreened tubers. The light has certainly got a stimulating effect due to photosynthesis which influences the growth of the buds. It is also quite evident from the result that the rate of sprouting of greened tubers under wet condition is much nearer to that of peeled tubers kept wet (Table I). Greening method is seen to be the best for hastening sprouting. It has a further advantage in that extra trouble due to peeling is avoided and there is practically no loss of tubers from rottage.

These experiments were conducted on too small a scale to allow of definite conclusions. The results, however, are highly indicative. The experiments will be repeated on bigger scale so that some definite and practicable results may be obtained.

C. Cotton.—Fifty varieties of long staple cotton were under observation and grown in single rows. An intensive plant-to-plant study was made on the following characters :—

(*i*) Branching habit, (*ii*) date of flowering, (*iii*) number and size of bolls, (*iv*) weight of kapas, (*v*) ginning percentage and (*vi*) lint length. Selfing on an extensive scale was carried out amongst the promising varieties. Twelve varieties had too much of vegetative growth and consequently there was no flowering. They were rejected.

The varieties Local Rangamati, Garo Hills and Naga Hill were found to be considerably mixed. The typical plants were selfed and seeds obtained would be grown next year for pure-line section.

One 4-locked type of Garo Hill cotton, selected last year, was grown and it bred true to type for this character.

Amongst the long staple cotton Co. 2 was found to be the best and maintained its superiority as reported last year. This type is likely to thrive well under the climatic conditions obtaining here.

D. Sesamum (*Til*).—Thirty-eight strains of *sesamum* obtained from Burma, Central Provinces and United Provinces were grown in single lines to study their suitability under conditions, here A good number of these strains is characterised by a tall rich branching habit, medium or late maturity, large white and brown seeds. A great variation was found in the number of capsule per plant, number of seeds per capsule and weight of seeds. These characters are considered as of economic importance. Twenty-two plant selections were made for further studies.

E. Soybean.—Forty-five types of Soybean were grown in single rows and detailed notes were recorded with regard to the following characters:—

(*i*) branching habit, (*ii*) shape and size of leaf, (*iii*) ability to retain leaves, (*iv*) number of pods per plant, (*v*) number of seeds per pod, (*vi*) colour and size of seed, (*vii*) shattering habit of pods and (*viii*) maturity.

The most promising types for fodder and grain were isolated and plant selections were made.

Soybean has a great possibility in Assam. It is likely to be one of the most profitable crops. Several enquiries were made by European Tea Planters and they want to take up the cultivation of this crop on a large scale.

F. Groundnut.—Twenty varieties of groundnut, obtained from Burma, Madras, and Central Provinces, were tried in test plots in order to study their general suitability here. Seven varieties were found to be spreading and thirteen varieties were erect in habits. Plant selections of sixteen varieties were made for further observations next year. The varieties A. H.-32, Java, Improved Spanish and Akola 12·24 were severely affected by *cercospora* and were discarded.

G. Mustard.—Forty types of mustard and Sarson obtained from different provinces of India were grown in small plots for observation. Due to a severe attack of aphides the crop was badly damaged. Small quantities of seeds obtained will be grown at the Kakilamukh Farm where the soil condition is favourable for the cultivation of mustard and Sarson.

H. Pulses.—Some preliminary observations were made on different types of lentil, *matikalai*, *mung*, gram, peas, *khesaries* and *arhar*. A good number of the local types of pulses has been collected for pure-line selection. The work will be done at the Kakilamukh Farm.

I. Tobacco.—Twenty-five types of tobacco were under observation. Four types of cigarette tobacco, *viz.*, Adcock, Harrison's Special, Pusa hybrids 142 and 177, grew luxuriantly. Individual plants of the promising types were selected and seeds raised by bagging for maintaining the purity of the types. In the absence of a "Barn house" the leaves could not be flue-cured.

J. Fibre crops.—

(*i*) *Jute.*—Six selected types of the last year were under observation. Varietal trial could not be conducted owing to the lack of proper facilities for work. One local type, called "Assamia", gave the highest yield. A comparative study with proper replications will be done next year.

(*ii*) *Hibiscus sabdariffa var. altissima.*—Three types were under observation in small plots. The highest yield was obtained from the type 6. The average height of the plants was 14′. The fibre extracted was strong, white and very glossy. Harvesting the crop at dead ripe stage yielded the highest quantity of fibre. This crop might be profitably extended in high land areas with moderate rainfall.

(*iii*) *Rhea.*—A good number of plants are growing very successfully. The plants are prolific and produce very good fibre. Ten pounds of fibre have been sent to Horas and Company Limited, London, for testing the quality of the fibre with the "Freeman process". Several British firms made enquiries about thea asking whether fibre could be supplied regularly in large quantities.

A branchless type of rhea has been obtained from the last year's collection. Work on improved method of cultivation is in progress. A variety of rhea that sets seeds has been obtained from Bengal and it will be studied next year.

(*iv*) *Sisal hemp*.—The plants of the species *Agave sisalina* are growing quite successfully. The National Planning Committee, Bombay, requested the Assam Government to investigate the possibility of the cultivation of *Agave cantala* in this province. Fifty suckers of this species were obtained from the Department of Agriculture, Bombay. The plants are making rapid growth and seem to be well-suited to heavy rainfall conditions. In addition to yielding valuable fibre the leaves of *A. Cantala* produce valuable organic fertilizer rich in lime, magnesia and phosphate. This plant has the further quality of protecting embankment and stopping soil erosion.

K. Oat.—Thirteen types of oat obtained from Sweden and the Punjab were grown in small plots. Two broad-leaved types, *viz*., No. II and Weston Oat, yielded a very high quantity of fodder. The varieties grew luxuriantly without rain or irrigation water and seem to be drought resistant. B. S. 1 and Fo.S.-1/29 gave the highest yield of grain. A yield trial with proper replications will be made next year.

L. Clover.—*Trifolium alexandrinum*, *Trifolium resupinatum* and *Melilotus parviflora* were grown in small plots in the *rabi* season. The crop grew quite well and set seeds. If irrigation arrangements can be made the crop may be introduced as leguminous fodder. Further experiments on this crop will be made.

M. Effect of Colchicine for the Production of Polyploid Plants.—One of the most startling genetic discovery of the recent years is the effect of colchicine for doubling of chromosomes. The practical implications of this to the plant breeder are unquestionably of very great promise. Attempts were, therefore, made to produce polyploid plants of *Brassica Juncea* and *Gossypium cernum* by adopting the following methods :—

(*i*) *Rai*.—Seeds of Brassica were soaked in ·1, ·5 and 1 per cent. solutions of colchicine for 8, 24 and 48 hours. Increased concentrations and longer durations caused considerable delay in germination. Sprouted seeds when planted in pots died within 3-4 days. Treatment for 24 hours in ·1 per cent. solution gave satisfactory results. The swollen roots of the seedlings indicated tetraploidy. The plants when grown in the field showed rough leaves. From 83 plants grown only 11 plants are supposed to be tetraploids. The plants showed increased vigour, larger flowers and seeds. Giant pollen grains gave a further indication of tetraploidy. Seeds have been collected for a study of tetraploid progenies.

(*ii*) *Cotton*.—Young flower buds of *G. cernum* were treated with a solution of ·1 per cent. colchicine in agar for 48 hours. Out of 40 treated flower buds only 8 withstood the treatment and developed bigger sized bolls. Seeds have been kept and the progenies will be studied next year.

Owing to the lack of facilities, cytological studies could not be done.

It may be mentioned here that there is no Botanical Assistant, Field Assistant or even a Field man at the Jorhat Laboratary to look after the crops properly. Hence it is not possible to do any work systematically. The question of the improvement of these crops is the most important at the present moment. It is expected that necessary staff and funds would be forthcoming immediately to take up the work seriously.

II. AGRICULTURAL CHEMISTRY

A short summary of the work undertaken in this section during the year under report is given below :—

1. *Sugarcane.*—Research on sugarcane, which remained under Chemical control, was the main item of work in this section. The research scheme was financed partly by the Imperial Council of Agricultural Research. It consisted of studies of new varieties of cane received from Coimbatore from time to time and experiments on varieties, manures and cultural operations including analysis of juice in all cases. Full details of work done will be found in the Annual Report of the Sugarcane Research Station at Jorhat, which is issued as a separate publication by the Imperial Council of Agricultural Research. A summary of the work will be found in Appendix I (*i*) of this report.

2. *Soil analysis.*—Thirteen samples of soil from different localities were analysed both for mechanical and chemical constituents. Most of the samples were analysed mainly in connection with specialised farming taken up by private individuals. The results of analysis which are interesting in certain cases are given below in two series in Tables I and II.

TABLE I

Mechanical and Chemical analysis of soil (1939-40). 1st Series

——	Nahatia—Teok, Jorhat. Soil from vegetable garden	Nahatia—Teok Jorhat. Soil from vegetable garden	Orange garden (Latu), Sylhet	Pishima, Naga Hills. Soil from paddy land	Fandal, Manipur. Soil from paddy land	Kangchap, Manipur Soil from paddy land
A. Mechanical analysis—						
Per cent. Coarse sand	2·60	2·30	59·20	4·50	1·00	1·00
Per cent. Fine sand	51·10	48·10	10·10	14·40	3·50	31·90
Per cent. Silt	22·30	21·30	3·10	22·50	15·10	23·30
Per cent. Fine silt	15·60	16·70	18·00	35·10	42·50	28·70
Per cent. Clay	6·50	9·30	7·30	19·70	32·60	12·50
Per cent. Moisture	1·20	1·40	1·20	3·40	4·60	2·40
Per cent. Loss on iginition ..	3·00	3·40	3·80	6·20	8·40	5·00
B. Chemical analysis—						
Per cent. Nitrogen	·115	·119	·172	·233	·264	·159
Per cent. Available P_2O5 ..	·0168	·0257	·0172	·0641	·0301	·0287
Per cent. Available K_2O ..	·011	·013	·008	·076	·03	·024
Per cent. Total P_2O5 ..	·0633	·0685	·0917	·2789	·1048	·0967
Per cent. Total K_2O ..	·151	·223	·104	·796	·978	·809
Per cent. Total lime ..	·253	·241	·108	·277	·325	·144
Acidity in parts Ca O per million parts soil.	33·6	50·4	162·4	44·8	33·6	554·4

Numbers 1 and 2 are lights soils, the latter being a bit more clayey than the former. The high percentage of fine sand in the sample is a drawback which has the tendency of setting into a hard mass after precipitation and may sometimes seriously interfere with proper aeration of the soil. The soil is to be constantly forked up for maintenance of proper aeration as soon as any adverse condition is noticed. Organic matter, especially cowdung, is highly recommended for these soils both for supply of plant food and improvement of soil tilth. Chemically, both the samples are quite good compared to their light sandy texture. The percentages of nitrogen is fairly high and what is unusual for such soils is that the percentage of available phosphoric acid is also fairly good. All credit for the improved condition of the soils goes to the owner of the land, Srijut Indreswar Chakravarty, an Honorary Orgainser of the Department who is himself a farmer and takes the trouble of manuring his soil continuously and adequately. He uses about 300 maunds of cowdung, equivalent to 120·lbs. nitrogen per acre, a dose which is recommended by our Department for such light soils. He also uses oilcake (mustard) to supplement cowdung, the price of which at present is not prohibitive. His farming mainly consists of vegetables which requires heavy manuring and is running on a small profit even against many odds. That cowdung is a very precious manure and should be properly utilized instead of being wasted or carelessly handled is simply proved. Some of the artificial fertilizers in light doses as supplementary dressings to cowdung will be found to be very useful and profitable for his farming.

Number 3 is a sample from an orange garden of the Surma Valley. The very high percentage of coarse sand in it makes it very well drained, which is essential for orange, but simutaneously lessens its water retaining capacity especially during drought. Chemically, the soil is rich with a high percentage of nitrogen. Proper mulching by addition of leaf-mould or otherwise to conserve soil moisture is recommended. The percentage of available P_2O_3 is fair but addition of phosphatic manures, especially the insoluble types, will be further helpful. Potash both total and available is rather low and any addition of it will be· beneficial.

Number 4 is a sample of soil from paddy land of the Naga Hills, an ideal and very rich sample of soil both mechanically and chemically. The mechanical constituents are very well-balanced. Chemically, the soil is very rich with a high percentage of nitrogen and a very high percentage of available phosphoric acid which is unusual for Assam soils. Any crop grown on these soils is likely to be charged with high nutritive value and no wonder that the hardy and robust Naga constitution may owe its origin fundamentally to the typical fertile condition of the soil. The statement requires corroboration by further analysis of more samples. Such lands should also be suitable for citrus and most other crops in general. A good soil like this may, however, be gradually rendered poor by erosion, conditions for which are always very favourable in the Hills. It is highly desirable that prevention of soil erosion be seriously taken up in the hills which can both help the maintenance of soil fertility in the hills and prevent floods in the valley below.

Numbers 5 and 6 are samples of soil from paddy land of Manipur. No. 5 is a more clayey soil with a higher nitrogen content than sample No. 6. The former is a very rich soil with a low acidity and should be quite suitable for paddy. Number 6 also is a fairly rich soil although markedly poorer in nitrogen than No. 5. The phosphoric acid contents of these soils are very high, though not of the same extent as in No. 4.

All these three samples of soil from the Naga Hills and Manipur, especially the one from the Naga Hills, are very fertile compared to soils of the plains and it would be interesting and helpful to note the average outturn of paddy from such localities with the object of increasing the output obtained in the plains.

TABLE 2

Mechanical and chemical analysis of soil (1939-40.) *2nd Series.*

—	Sylhet Vidyashram 1	Sylhet Vidyashram (another area) 2	Soalu plot near Palashbari 3	Soalu plot, Government Sericulture Farm, Titabar 4	Rajgarhali Nort Lakhimpur 5	Matekapathar, Sibsagar (paddy land) 6	Kuthari Nowgong High land under pineapple, orange, etc. 7
A. Mechanical analysis—							
Per cent, Coarse sand	39·70	39·40	31·40	4·40	36·60	0·20	2·20
Per cent. Fine sand ..	33·50	29·10	22·30	52·10	42·80	34 80	27·60
Per cent. Silt ..	7·40	8·70	17·60	18·10	8·60	27·50	18·90
Per cent. Fine silt .. .	8·20	6·90	12·30	12·30	7·90	24·30	20·90
Per cent. Clay ..	8·50	12·70	13·10	10·00	2·00	10·20	25·10
Per cent. Moisture ..	1·80	2·20	2·40	2·00	1·20	2·00	3·20
Per cent. Loss on ignition.	2·80	2·80	4·00	2·80	2·00	4·00	5·40
B. Chemical analysis—							
Per cent. Nitrogen ..	·11	·082	·125	·106	·07	·153	·135
Per cent. Available P_2O_5	·0083	·0038	·0027	·0031	·0086	·0162	·0018
Per cent. Total P_2O_5	·0455	·0384	·0483	·0324	·0343	·0679	·0509
Per cent. Total K_2O	·24	·41	·38	·29	·10	·68	·46
Per cent. Total Lime	·15	·13	·200	·32	·64	·27	·19
Acidity in parts Ca O per million parts soil.	403·2	1080·8	61·6	487·2	246·4	Alkaline	1097·6

Samples Nos. 1 and 2 from Vidyashram, Sylhet, are very sandy and are also poor in plant food materials. The nitrogen and phosphate contents are low, especially in No. 2 which is also very acidic. For successful farming,

due care should be taken about manuring. Nitrogenous manure is the prime necessity which should best be applied in the form of organic manures, supplemented by artificial fertilisers, if need be. Green manuring as a rotation should also be very helpful for these soils. Phosphatic manure notably for fruit trees and *rabi* crops is a distinct necessity and it should be used in the form of insoluble phosphates, such as bonemeal or other mineral phosphate. For *rabi* crops, liming would also be found very helpful.

Numbers 3 and 4 are samples from 'Soalu' plot, the former from Palashbari near Gauhati where 'Soalu' thrives very well and the latter from the Titabar Sericultural Farm where the growth of the tree is unsatisfactory, the tree not attaining full size as found in Palashbari. There is not much difference between the two samples, except that the soil from Palashbari is capable of being more well drained and has a higher organic matter and nitrogen content than the Titabar soil. Besides, the Palashbari soil is less acidic (verging on neutrality) than Titabar soil which may be responsible for the poorer growth of the trees in the latter. It has been observed that "soalu" trees at Titabar and in Upper Assam generally have insect pests, which bore through the main trunk. It is to be seen whether the poorer growth is due to insect troubles or has got something to do with soil condition. Anyway, it will be worthwhile to take up a manurial trial on a few trees at Titabar with liming and nitrogenous manures.

Number 5 is a sample from North Lakhimpur where private farming has been undertaken. It is a very light soil with about 80 per cent. sand and a very low percentage (2·0) of clay. It is doubtful whether the soil will be sufficiently retentive of moisture, especially during winter and drought. The soil profile needs, however, to be carefully examined to ascertain this point. Chemically the soil is poor in nitrogen and essentially requires continuous and adequate manuring with organic nitrogenous manures, which will also improve the texture of the soil making it more retentive of moisture. Phosphoric acid is not so low and this shows that the soil has, directly or indirectly, a riparian origin which is further characterised by its low acidity. The soil appears to be suitable for *rabi* crops with proper manuring. Fruit cultivation can also be undertaken but regular application of both nitrogenous and phosphetic manures will be required. The soil has one great advantage of being well drained, which is necessary for fruit trees, and, if other conditions can be fulfilled, fruit growing is likely to be profitable. Green manuring now and then will be very useful to improve the soil condition.

Number 6 is a sample from Meteka Pathar, a very fertile paddy field of the Sibsagar district. The soil analysis reveals the same fact. The soil is not very clayey but has enough of silt and fine silt well balanced with sand. The nitrogen content is fairly high and so also the phosphate content. It has generally been found that the percentage of phosphoric acid in both paddy fields and high lands of the old alluvial soils is low but the sample is an exception in being rich enough in this material compared to other soils. The nutritive value of paddy grown in such soils may also be higher and it is a question well worth investigation during these days of dietetics. A happy and possible correlation to be observed connected with it is that Sibsagar people are healthier and more well built than the people of its adjoining subdivision of Jorhat where the phosphoric acid contents of soil are low. Manipur and Naga Hills are further richer than the Sibsagar sample

with possibly a further improvement in the physical stature of the inhabitants.

Number 7 is a sample of high land soil of the Nowgong district where pineapple is grown on a big scale. Mechanically, the soil is good with a high clay content which will make it more retentive of moisture. The organic matter and nitrogen contents of the soil are fairly high but with continuous cropping, due care should be taken to replenish the nitrogen supply. The soil is very acid with a low percentage of available phosphoric acid and may not be quite suitable for *rabi* crops and citrus for which liming and addition of phosphatic manures of the insoluble type, such as bonemeal, alphos, etc., will be necessary.

Besides the above, several samples of soils were analysed for acidity and PH value in connection with manurial experiments and other observations connected with remedial measures for unsatisfactory growth condi tion of crops.

3. *Analysis of manures.*—Samples of cowdung, oilcake and compost, required for manurial and other experiments, were analysed from time to time.

4. *Analysis of feeding stuff.*—Analyses of aquatic grasses, collected from low-lying areas of Sylhet and Habiganj, were continued. Six such samples were analysed during the year under report.

5. *Miscellaneous analysis.*—Several samples of different green manures in connection with green experiments were analysed. Meteorological obserlowtions consisting of rainfall maximum and minimum temperatures, humidity and soil temperatures were recorded in this section throughout the year.

6. *Manurial experiment on paddy.*—A manurial experiment on *sali* paddy was taken up at the Titabar Farm to test the effect of green manuring with sunnhemp, alone and in combination with lime and cowdung. For the purpose of green manuring sunnhemp was hoed down into the soil at the rate of 8,600 lbs. of green crop per acre, before growing paddy. It may be noted that the original idea was to grow the green crops *in situ* and plough them under, but the crop failed twice due to water-logging on low-lying areas. Consequently sunnhemp grown elsewhere on higher areas had to be added at the rate stated, about a month ahead of the transplanting of paddy. In one treatment, slaked lime was applied at the rate of 30 maunds per acre previous to the growing of sunnhemp to reduce soil acidity for better growth of the crop. In another treatment, a light dressing of cowdung was applied at the rate of 40 maunds per acre with the idea of accomplishing quicker decomposition of the green stuff. The experiment was conducted in randomised blocks with six replications for each treatment. A summary of the results is given below :—

Grain

Treatment per acre	No manure	Sunnhemp green manured	30 maunds lime + sunnhemp green manured	Sunnhemp green manured + 40 maunds Cowdung
Average yield in lbs. per acre.	2,120	2,106	2,186	2,033

The statistical analysis has not been worked out on account of the very unsatisfactory nature of the results. The results are also inconclusive due to the fact that the crops on the manured plots, although giving much better growth than the control plots, badly lodged about 3 weeks before harvesting which tended to the formation of false grains in the lodged crop. As also the green crop had not sufficient incidence of rainfall subsequent to its incorporation into the soil, it was likely that the green crop did not have sufficient time for its proper decomposition. It has, therefore, been decided to test the residual effect of the treatments in the same plots in the year following.

7. *Manurial experiment on Potato.*—A manurial experiment on potato was taken up at the Upper Shillong Farm to test the effect of compost prepared at the farm as compared to cowdung and oilcake. The experiment was conducted in randomised blocks with six replications for each treatment. A summary of the results is given below:—

Treatment per acre	Control	Cowdung 300 maunds	Oilcake 30 maunds	Compost 300 maunds	General mean	S.E.	C.D. (5 per cent.)
Average yield in lbs. per acre.	2,320	5,200	4.640	3,880	4,010	543·2	1631·[illegible]
Per cent. on general mean.	57·85	129·67	115·73	96·77	100	..	..

Although the average outturn of potato in the experimental area was poor due possibly to inclement weather condition, the results appear to be quite satisfactory. Compost gave a substantial increase of 67·2 per cent. over control which was almost significant. Cowdung gave the best result of more than cent per cent. increase over control, followed by oilcake which also gave just cent per cent. increase over control. That manures can play their part very prominently under indifferent conditions of climate, etc., has been clearly shown by the results of this experiment. The experiment has been repeated with a little amplification for confirmation of results.

Another experiment to test the effect of different green manures on potato was tried at the same farm. As the green manures could not be grown successfully, the experiment had to be dropped. The experiment has been taken up for the next year.

III. ENTOMOLOGY

A.—*Sugarcane*

In addition to the top shoot borers of sugarcane, *viz.*, Scirpophaga auriflua and S. nivella, and the stem borers, *viz.*, Argyria sticticraspis, and Diatraea venosata, another pest (Argyria tumidicostalis) has

been recorded at the Jorhat Farm. Diatraea venosata is a minor pest and its damage is time limited. The percentages of attack by all pests, as obtained from the roguing operations are detailed below :—

Scirpophaga spp.—41·44 per cent. against 54·04 per cent. in previous year.

Argyria spp.—10·24 per cent. against 21·28 per cent. in previous year.

Diatraea spp.—1·57 per cent. against 1·42 per cent. in previous year.

It thus appears that in the case of both the major borer pests, the recorded percentages during the year under report are much lower than those of the previous year.

The usual check and control measures, including biological control in a small scale, were adopted. The total percentage of attack which includes the canes dead due to borer attack but the classification of which is not possible owing to the absence of the borers in them, may be compared with those of the last two consecutive years, thus :—

1939-40	71·84 per cent.
1938-39	84·44 per cent.
1937-38	79·86 per cent.

The variation within 10 per cent. and in fact the higher the percentage of dead hearts removed, the bigger the number of the pests killed and the more successful is the control.

The percentage of infestation by other minor pests, such as white ants, crickets, etc., worked out at only 2·16 per cent. as against 2·62 per cent. in the previous year.

The check and control measures adopted may be detailed as follow :—
(*a*) Rouging operations (both plant and ratoon canes taken together).

TABLE I

Showing the results of the rouging operations month by month—1939

Month	Scirpophaga spp.		Argyria spp.		Diatraea sp.		Borer absent		Total borers		External agents		Other causes		Total No. of dead hearts removed.
	Affected	P.C.	Affected	P.C.	Affected	P.C.	Affected	P.C.	Affected	P.C.	Affected	P.C.	Affected	P.C.	
May ..	650	7·45	643	7·37	246	2·81	2,990	34·27	4,529	51·92	307	..	3,888	..	8,724
June ..	1,183	14·77	788	9·84	290	3·69	3,450	43·08	5,711	71·31	217	..	2,080	..	8,008
July ..	2,024	35·93	211	3·74	50	·88	1,447	25·66	3,732	66·19	136	..	1,770	..	5,638
August ..	5,775	66·02	945	1·80	8	·09	822	9·39	7,550	86·31	146	..	1,051	..	8,747
September ..	4,718	64·49	765	1·45	..	..	1,135	15·51	6,618	90·47	216	..	481	..	7,315
October ..	3,989	56·33	1,164	16·43	..	..	1,672	23·61	6,825	96·38	66	..	190	..	7,081
November ..	2,654	51·60	673	13·08	..	..	1,649	32·06	4,976	96·75	11	..	156	..	5,143
	20,993	41·44	5,189	10·24	594	1·57	13,165	25·98	39,941	78·84	1,099	2·16	9,616	18·98	50,656

TABLE VI (*a*)

Results of rouging variety by variety

Variety	Top-shoot Borer	Argyria sp.	Diatraea sp.	Borer absent	Total borer affected	P. C.	External agents	Other causes	Total No. of dead hearts removed
Poj. 2,714	2,618	893	141	2,703	6,355	71·07	235	2,351	8,941
Poj. 2,878	1,128	190	27	682	2,027	73·30	133	605	2,765
Co. 290	4,633	891	86	2,118	7,728	89·18	99	838	8,665
Co. 313	606	134	11	518	1,269	82·77	4	260	1,533
Co. 361	844	535	73	1,359	2,811	72·31	68	1,008	3,887
Co. 408	193	154	9	406	762	76·27	7	230	999
Co. 419	3,100	566	41	1,180	4,887	86·95	130	603	5,620
Co. 421	879	197	14	443	1,533	75·44	26	473	2,032

The percentages of infested canes were high all throughout the year, but there was an appreciable rise towards the close of the operations. It appears from Table I(*a*) that the most popular variety, Poj.2714 and Co.219, are very much susceptable to borer infestation.

Table I may be shown separately in terms of plant and ratoon canes as follows :—

TABLE II

(*Plant canes*)

Month	Scirpophaga sp.	Argyria sp.	Diatraea sp.	Borer absent	Total borer affected.	P. C.	External agents	Other causes	Total No. of dead hearts removed
May	53	159	98	956	1,266	..	99	1,653	3,018
June	368	287	173	2,024	2,852	..	141	1,418	4,411
July	710	92	29	548	1,379	..	77	375	1,831
August	2,027	211	1	132	2,371	..	92	52	2,515
September.. ..	2,394	270	..	294	2,958	..	145	92	3,195
October	2,305	323	..	447	3,075	..	41	34	3,153
November	1,207	197	..	196	1,600	..	3	16	1,619
	9,064	1,539	301	4,597	15,501	78·52	598	3,640	19,739

TABLE II(*a*)

(*Ratoon canes*)

Month	Scirpophaga sp.	Argyria sp.	Diatraea sp.	Borer absent	Total borer affected	P.C.	External agent	Other causes	Total No. of dead hearts removed
May	597	484	148	2,034	3,263	..	208	2,235	5,706
June	815	704	117	1,426	3,062	..	76	662	3,800
July	1,314	119	21	899	2,353	..	59	1,395	3,807
August	3,748	534	7	690	4,979	..	54	999	6,032
September	2,324	495	..	841	3,660	..	71	389	4,120
October	1,684	838	..	1,225	3,747	..	25	156	3,928
November	1,447	476	..	1,453	3,376	..	8	140	3,524
	11,929	3,650	293	8,568	24,440	79·05	501	5,976	30,917

It appears from the above statements that the plant and the ratoon canes are almost equally infested by borers.

(*b*) *Hand selection of setts*.—Thirteen thousand six hundred setts from a number of recommended varieties of canes were examined for selection of borer-free setts, with the following results:—

TABLE III

Percentage of setts affected

Variety	Total No. of setts examined	Number of setts affected	Per cent.
Poj. 2714 ...	8,000	1,543	19·28
Poj. 2878 ...	300	42	14·00
Co. 290 ...	1,200	361	30·08
,, 213 ...	300	58	19·33
,, 361 ...	600	245	41·25
,, 408 ...	800	146	18·25
,, 419 ...	1,600	293	23·50
,, 421 ...	800	413	51·62
	13,600	...	27·16 %

(*c*) *Light traps*—The following shows the catches of sugarcane borer moths at light traps during the last three consecutive years :—

1939-40	8,709
1938-39	397
1937-38	8,810

The catches and the results of dissection of the various species are shown below :—

TABLE IV

Month	Total No. of white borer moths captured	Total No. of captured stem-borer moths		White borer moths		Argyria sp.		Diatraea sp.		Total
		Argyria sp.	Diatraea sp.	Gravid females	Fertile females	Gravid females	Fertile females	Gravid females	Fertile females	
1939-40 May	677	27	11	247	114	10	9	3	7	715
June	496	11	10	178	90	3	5	4	2	517
July	1,789	44	19	512	283	20	11	8	5	1,852
August	1,596	31	13	415	215	12	7	6	2	1,640
September	595	14	8	154	95	6	3	3	2	617
October	1,696	28	15	396	213	13	6	7	3	1,739
November	1,556	27	20	387	219	9	8	7	3	1,603
December	23	3	..	7	3	1	1	..	..	26
	8,428	185	96	2,296	1,232	74	50	38	24	8,709

Considerably high catches were made during July and October and the number went down in December abruptly along with the advent of winter.

(*d*) *Biological control*.—The following is the statement showing the total number of collected and liberated clusters of cocoons of the parasite of the Apanteles sp., block by block of the Jorhat Sugarcane Farm and month by month. The total number of cocoon clusters during the year under report was 234 as against 115 in the previous year.

TABLE V

Statement showing the total number of collected and liberated clusters of cocoons of parasites of the Apanteles sp., block by block and month by month

1939	Blocks—	L	R	A	4	1a	6	1	2	9	E	F	P	Total
June	Collected ..	..	..	..	..	..	4	..	..	..	..	..	..	4
	Liberated ..	..	..	..	4	..	..	..	..	..	..	..	..	4
July	Collected ..	..	2	2	8	..	13	3	1	..	6	..	..	35
	Liberated ..	..	..	..	16	19	..	..	..	..	..	..	..	35
August ..	Collected ..	7	2	2	4	..	13	2	4	4	7	4	..	49
	Liberated ..	..	..	..	..	..	..	23	17	9	..	..	..	49
September	Collected ..	16	4	10	3	1	4	2	4	4	6	2	9	65
	Liberated ..	19	20	7	..	..	19	..	..	..	..	..	..	65
October	Collected ..	7	..	9	8	2	9	2	6	7	8	..	..	58
	Liberated ..	..	..	21	..	..	..	..	..	..	33	..	..	54
November	Collected ..	..	..	..	9	2	3	..	3	4	2	..	..	23
	Liberated ..	..	..	..	..	..	..	..	..	..	..	21	6	27
Total ..	Collected ..	30	8	23	32	5	46	9	18	19	29	6	9	234
	Liberated ..	19	20	28	20	19	19	23	17	9	33	21	6	234

This indigenous parasite has made only a steady progress in establishing itself and the factors governing its development are still most uncertain. No hyperparasite has yet been recorded. The meteorological conditions may probably be responsible and they have to be worked out.

(e) Examination of millable canes.—Lots of harvested canes from the different blocks were picked up at random and they were examined to study the actual percentage infestations of the different varieties. The results for the last 4 years are compared below :—

TABLE VI.—(*Percentage infestation*)

—	1936-37	1937-38	1938-39	1939-40
Poj. 2714 ...	40·2	36·8	46·9	42·39
Poj. 2878 ...	17·2	10·1	47·8	30·46
Co. 210 ...	27·0	25·3	...	...
,, 290 ...	12·1	15·0	39·4	33·97
,, 213 ...	8·8	15·3	...	...
,, 313 ...	27·7	22·7	51·0	32·83
,, 361 ...	12·6	8·0	42·5	33·5
,, 407 ...	45·3	19·6	47·2	...
,, 408 ...	20·9	13·3	29·9	25·73
,, 411 ...	34·3	25·4	...	28·38
,, 419 ...	10·4	15·2	40·9	...
,, 355 ...	10·6	30·0	...	...
,, 421 ...	...	...	29·2	30·66

There is a distinct reduction in the infestation of some of the important varieties by borers.

On comparing the above results for 1939-40 with those in Table VI (*a*), as given below, it becomes evident that some varieties are more susceptible to attack during the early period of growth and they become more resistant along with approach to maturity. This decrease may also be attributed to the roguing operations during the early period.

TABLE VI (*a*)

—	Poj. 2714	Poj. 2878	Co. 290	Co. 313	Co. 419
Pecentage infestation during roguing.	71·07 %	73·30 %	89·18 %	82·77 %	86·95 %
Percentage infestation in harvested canes.	42·39 %	30·46 %	33·97 %	32·83 %	28·38 %

B. Paddy.—The contemplated campaign against the severe attack of hispa pest was taken up during the year under report with unique success and a detailed report on the subject has been submitted.

The work has to be continued for at least another 3—4 consecutive years, taking up the campaign as early as possible, *i.e.*, in February or March.

The total quantity of hispa collected during the year amounted to 23 maunds and 6 seers and as a result, an enormously bigger outturn of paddy was recorded by the cultivators.

Paddy-stem borer incidence is gradually getting more acute. Suitable measures have been recommended and demonstrated to the cultivators.

Paddy case worm, paddy swarming caterpillers, and army worm are coming into prominence in certain localities. In certain places like Habraghat in the Goalpara District army worm infestation closely followed an infestation by swarming caterpillers and thus caused heavy loss.

The *boro* fields suffered a lot from hispa and rice-bug incidence in the previous year but this year these pests were kept completely under control.

The year was peculiarly favourable for the stored grain pest. A stock of paddy was very severely infested in the granary of Mr. C. Goldsmith, B.A., B.T., M.L.A., and it was successfully treated by the Department.

Rice leaf hopper caused appreciable damage to seed-beds in Golaghat. It was most successfully controlled with light traps in certain localities.

C. Fruits.—The following important pests were dealt with :—

(*a*) Trunk and shoot-borers, lemon caterpillers and green bugs in the citrus trees and fruits.

(*b*) Litchi leaf mites.

(*c*) Xylotrupes gideon in pineapples.

A new bark eating beetle pest of citrus seedlings and plants is under observation. Some detailed work on its control are needed.

D. Oilseeds and Pulses.—The mustard aphis was very abundant this year and caused very severe damage to the crop.

The swarming capterpillars of paddy damaged *matikalai* in various localities. Sufficient propaganda regarding the control of this severe pest was taken up.

E. Experimental Crops.—Various pests affecting the various experimental crops in the blocks attached to the Jorhat laboratory were dealt with. The *arhar* weevil of the Apion sp. proved to be still very severe.

F. Combined Entomological and Mycological work.—Control of citrus pests in the farm of Dr. Danish Muhammed was taken up on an experimental basis. This was taken up in close co-operation with the control of disease by the Mycological Section and the results were satisfactory. Such combined work, especially in the case of citrus and other fruit plants, appear necessary in the cultivators' fields also.

G. Exhibitions.—Agricultural exhibitions were attended at Jhanji, Patacharkuchi and Potiagaon.

H. Bee-keeping. Bee-keeping is becoming more and more popular from year to year and many educated persons have taken it up. Some local beekeepers have been successful in getting good quantities of honey. This they have done so far in the Departmental boxes and also under Departmental supervision. They are finding a ready sale for their produce. Seven colonies have been maintained in the apiary attached to the Jorhat laboratory.

I. Collection and Rearing.—These were continued as usual. 63 specimens were added to the collection.

IV.—MYCOLOGY

1. *Orange.*—(*a*) Yellowing disease.—Experiments have been started to study the control of this disease. Some diseased plants are being treated with zinc sulphate and blood albumen mixture and some are being treated from the cultural side. The result remains to be seen.

(*b*) Colletotrichum Gleosporides associated with Phomopsis Calitornica.—Some diseased materials were received from the Horticultural Assistant. The diseases were indentified and remedial measures were suggested.

(*c*) *Capnodium sp.*—Some diseased materials were received from the Agricultural Inspector, Mangaldai. The disease was identified and control measures were suggested.

2. *Lady's finger.*—(*a*) Leaf curl disease was found in some plots near Jorhat heavily infecting them. On microscopical examination Cercospora sp. was found and this was confirmed by cultural examination. No control measure was adopted. The plot was left for observation. It was noticed that the plants shook off the disease and revived along with age.

(*b*) Choanephora sp. Some plots at Titabar were found shedding their flowers very badly. The affected flowers on examination were found associated with this fungus.

3. *Peach.*—(*a*) Gummosis occurred at Jorhat. The disease yielded to the treatment.

(*b*) *Exoascus deformans*.—Peach leaf curl was noticed in a farm near Jorhat in exotic varieties. The plants were thoroughly sprayed with 1 per cent. Bordeaux mixture after removing the diseased leaves and stems. This controlled the disease.

4. *Chilli*.—One plot of chilli was found very heavily affected with vermicularia Capsici at Kakilamukh farm. All the diseased plants were rogued out. This diminished the extent of damaged but could not control the disease completely.

5. *Potato*.—(*a*) *Dry rot*.—This was found causing considerable loss in the stored potatoes. The parties were advised to pick up and remove the diseased tubers as soon as noticed.

(*b*) *Bacterial rot*.—This year not a single case of bacterial rot was noticed in the field. This might be an effect of the last year's roguing operation or due to a continued dry spell.

(*c*) *Heart rot*. Some diseased tubers were received for examination. On cutting open the tubers, black ring was noticed inside it. No fungus tissue was found on microscopical examination, but a growth of Fusarium was obtained in culture. This may be a saprophyte. This requires further study.

(*d*) *Alternaria solani*.—The attack due to this early blight was very mild and sporadic at Kakilamukh farm during this year. The amount of damage was very negligible.

(*e*) *Cercospora Concors*.—Some plots at Kakilamukh were found very heavily infected with this fungus. The diseased plots were sprayed with Bordeaux mixture 5·5·50 which controlled the spread of the disease.

(*f*) *Yellowing*. (Yellowing with leaf curl).—Some plants were found to show the signs of virus disease. On suspicion the diseased plants were roened out.

(*g*) *Wilt* (Fusarium oxysporum).—Some samples were received from outside. The disease was identified and remedial measures were suggested.

(*h*) *Scab disease*. (Rhizoctonia).—Some cultivators' plots at Kakilamukh were very heavily affected with this disease. Out of two maunds of potato it was very difficult to pick up twenty seers of healthy tubers. On microscopical and cultural examination of the diseased tubers Rhizoctonia was noticed. Regular rotation and selection of seeds are required to control this disease.

(*i*) *Late blight*. (Phytophthora infestans).—The season was so favourable for potato crop that late blight was noticed very sporadically.

The damage was very negligible.

(*j*) *Yellowing disease*.—Some plants of the pot culture experiment showed the symptoms of yellowing disease. The major portion of the plants turned deep yellow. The diseased plants were treated with a solution of ferreous sulphate which controlled the disease.

Some experiments have been taken up to see how the tubers can be stored for seed purpose in the plains.

6. *Brinjal*.—(*a*) *Fruit rot* (Gleosporium).—This was noticed in a plot causing considerable damage during rainy season. The party was advised to pick up the diseased fruits as soon as noticed.

(*b*) *Wilt*.—Some wilted plants were received in the laboratory for examination. The plants were found affected with Pythium. The party was advised on control.

7. *Betel nut*.—(*a*) Bleading disease. This disease was found present more or less in every betel nut cultivation. It was observed from time to time that the trees exposed to direct sunshine were more and heavily affected and the trees under partial shade did not suffer. It may be that shade has got an influence over this factor. This is worth trying.

(*b*) *Wilt*.—This was noticed in a seed bed at Jorhat. It was kept under observation and control.

8. *Pan*.—In connection with *pan* disease I visited a good number of cultivations at Jaintia, Karimganj, Sylhet, Maulvibazar, Habiganj and Haflong. A detailed report and programme of work have been submitted in this connection regarding control measures.

Another new disease was reported from a village Harinarayanpur at Karimganj subdivision. The report received from the party reminds us of a blight disease which has not been detected as yet though repeated search was made for it. During this winter season, when I visited those localities the disease could not be found and the parties also could not supply me with the same material. This will be tired again during the next rainy season. Some samples of diseased materials were sent to the Imperial Agricultural Research Institute for isolation of the fungi. They also did not get any blight definitely.

Some diseased samples were received from the Agricultural Inspector, Nalbari. They were examined, reported and remedial measures suggested.

9. *Cucumber*.—Some wilted plants were received for examination which proved the casual organism to be a species of Fusarium. The party was advised for control.

10. *Banana*.—Bunchy top was noticed at Cachar. The variety "Jahaji" was found more susceptible to the disease. This may be due to malnutrition. As a control measure a trial may be made with a fair dose of farm yard manure.

11. *Cotton*.—The different varieties of cotton grown at Jorhat experimental plots were under observation and control of diseases. The exotic varieties Vardas (Coimbatore) and Wagala Dieb (Allarmya) suffered from Fusarium wilt. They were kept under control by timely rouging. Some of the varieties suffered from Cercospora gossypina and this was kept under control by spraying the crop with 1 per cent. Bordeaux mixture.

12. *Jute*.—(*a*) Wilt (Rhizoctonia). This was noticed in the early stage of the growth at Jorhat. The diseasesd plants were timely rogued out and the spread of the disease was checked.

(*b*) *Stem disease*.—(Diplodia Corchori). Diseased specimens were received from Habiganj, the Deputy Director of Agriculture, Surma Valley and from Nowgong with reports that the extent of damage was very considerable. The disease was identified and remedial measures suggested.

This disease has become so prominent in the jute growing localities that varietal study is required to find out whether there is any resistive variety and whether the disease is propagated from seeds collected from affected plants.

This disease appeared at the Jorhat experimental plot also. But it was kept under control by timely roguing before the development of spores.

13. *Sunnhemp*.—There was a heavy attack of wilt disease in the early stage of the growth of the plants. The diseased plants were rogued out and examined. Pure culture of Rhizoctonia was obtained from the diseased materials. In the old stage of the plants, after flowering, there was another fresh attack in patches. The diseased plants were timely rogued out.

14. *Arhar*.—A study was made of different varieties to find out which one of the varieties was more resistant to wilt disease. It was found that the Pusa 64 was the worst sufferer during this year.

15. *Pears*.—Anthracnose disease (Gleosporium) seems to be a regular obstacle against pears. This disease is very much confined to the foreign varieties. The local varieties appear to be less affected. Further trial is required to find out if any resistant good variety can be available. The disease was always kept under control by spraying the trees repeatedly with 1 per cent. Bordeaux mixture. But this is not always possible, so a varietal study is essential.

16. *Black berry*.—A severe attack of Septoria appeared in pot culture a Jorhat. It was controlled by removing the diseased materials as soon as noticed and spraying with Bordeaux mixture.

17. *Paddy*.—(*a*) Piricularia Oryzæ and (*b*) Helminthosporium Orrzæ. These appeared at Titabar paddy farm in the seedling stage.

The extent of damage was not very serious. The disease was controlled by timely roguing out the diseased plants.

(*c*) Cephalosporium Oryzae.—A severe attack was found at Golaghat subdivision. This was associated with some insect attack. At the stage when the disease was noticed it was not possible to ascertain which one of the two was the prior cause of the disease. The extent of damage was so severe and advanced that nothing could be done at that stage. The plots were left to themselves, but under observation. Some of the plants shook off the disease along with age and gave a good flush of growth.

(*d*) Sclerotium oryzæ associated with Helminthosporium.—A very extensive damage was noticed in the Jaintia pargana. The damage was very severe and extensive and it appeared in several villages. The parties were advised on control measures for the next season.

(*e*) *Fusarium*.—Foot rot was noticed sporadically at Jorhat. The extent of damage was very negligible.

18. *Pineapple*.—Some diseased plants were received from Barpathar showing the symptoms of wilt disease. Examination did not reveal any fungus on the diseased materials. This might be due to some physiological factors. This is under observation.

19. *Sugarcane*.—The sugarcane crop of the Jorhat farm was under observation, study and control. The diseases found in different treatments are shown below :—

Table below shows the prevalence of different diseases month by month :—

Months	Total No. of canes examined	Bacterial rot	Red rot (Colletotrichum falcatum)	Rind (Melanconium Sacchari)	Smut (Ustilago Sacchari)	Fusarium top rot	Total No. of diseased canes	Remarks
	..	·99%	·9%	3·8%	..	1·2%	7·0%	
April ..	6,650	66	62	258	..	85	471	
	..	29·4%	6·4%	..	·08%	..	36·0%	
May ..	8,971	2,646	579	..	8	..	3,233	
	..	21·2%	1·6%	..	·5%	..	23·5%	
June ..	8,048	1,713	135	..	49	..	1,897	
	..	25·9%	5·0%	..	·4%	..	31·4%	
July ..	5,643	1,466	284	..	25	..	1,775	
	..	8·9%	2·9%	..	·04%	..	11·9%	
August ..	8,726	784	257	..	4	..	1,045	
	..	4·1%	2 4%	..	·04%	..	6·6%	
September	7,006	293	172	..	3	..	468	
	..	1·9%	·5%	·1%	..	..	2·7%	
October ..	6,922	133	41	14	..	..	188	
	..	2·7%	·2%	·03%	..	..	3·1%	
November..	5,027	140	14	2	..	..	156	
December..	..	..	..	..	..	..	..	Roguing operation was discontinued
	..	3·2%	·2%	3·3%	..	·8%	7·7%	
January ..	4,400	143	9	149	..	38	339	
	..	1·8%	·2%	1·0%	·01%	·1%	3·2%	
February ..	15,100	279	40	152	3	19	493	
	..	1·3%	..	·8%	..	·3%	2·5%	
March ..	11,700	160	..	95	..	42	297	
	..	8·8%	1·8%	·7%	·1%	·2%	11·7%	
Total ..	88,193	7,823	1,593	670	92	184	10,362	

Relation of varieties and different diseases.

Block	Variety	Treatment	Bacterial rot	Red rot (Colletotrichum falcatum)	Rind (Melanconium Sacchari)	Smut (Ustilago Sacchari)	Fusarium top rot	Total per cent. of diseased canes	Remarks
1	Co.355 ..	Major varietal.	23·4%	1·6%	..	..	..	25·0%	
	Co.356 ..	Experiment.	28·7%	·4%	..	..	..	29·1%	
	Co.360 ..	(Ratoon cane).	17·5%	3·0%	..	..	..	20·6%	
	Co.421 ..	..	28·7%	1·0%	..	..	..	29·7%	
	Co.290 ..	..	14·9%	·9%	..	..	..	15·9%	
	Total ..	..	22·8%	1·2%	..	..	..	24·1%	
4	Co.355 ..	Final	24·0%	1·6%	..	..	..	25·7%	
	Co.356 ..	Varietal.	26·1%	·9%	..	..	..	27·1%	
	Co.418 ..	Experiment,	16·4%	2·1%	..	..	..	18·6%	
	Co.421 ..	Plant cane.	16·6%	..	..	..	..	16·6%	
	Co.290 ..	..	12·6%	3·4%	..	..	..	16·0%	
	Total ..	..	18·1%	1·9%	..	..	..	20·0%	
E	Co.419 ..	Calcium cynomide experiment.							
		A.	4·4%	·6%	1·4%	·4%	·6%	7·4%	
		B.	5·0%	·2%	1·4%	..	1·0%	7·6%	
		C.	4·6%	2·5%	1·2%	..	·8%	9·3%	
	Total ..	..	4·7%	1·0%	1·3%	·1%	·8%	8·1%	

N. B.—A—Control, but received 125 maunds cowdung—50lbs. of Nitrogen per acre.—B.—Cowdung 300 maunds and oilcake 1,000 lbs. per acre.—170 lbs. Nitrogen. C.—Cowdung 125 maunds—50 lbs. Nitrogen 600 lbs. granular Calcium cynomide 120 lbs, Nitrogen 170 lbs. Nitrogen per acre.

Relation of varieties and different diseases.

Block	Variety	Treatment	Bacterial rot	Red rot (colletotrichum falcatum.)	(Rind Me anconium Saccharí.	Smut (Ostilago Sacchari	Fusarium top rot	Total per cent. of diseased canes.	Remarks
2	Poj.2714 ..	Rotation experiment. A.	32·0%	5·0%	..	..	..	37·1%	
		B.	28·1%	8·0%	..	..	..	36·2%	
		C.	29·2%	3·8%	..	..	..	33·0%	
		D.	31·2%	3·2%	..	..	..	34·4%	
	Total .	.	28·5%	4·8%	..	..	.. ..	33·3%	
	Co.290 .	A.	11·7%	·6%	..	..	.. ..	12·3%	
		B.	11·1%	·4%	..	..	..	11·6%	
		C.	11·4%	·9%	..	..	.. ..	12·5%	
		D.	8·8%	1·1%	..	..	..	10·0%	
	Total ..	..	10·7%	·8%	..	..	..	11·5%	

A Cowpea with a dressing of alphos at the rate of 6 maunds per acre. B Only cowpea. C Received 6 maunds of Alphos. D Fallow.

Block	Variety	Treatment	Bacterial rot	Red rot (colletotrichum falcatum.)	(Rind Me anconium Saccharí.	Smut (Ostilago Sacchari	Fusarium top rot	Total per cent. of diseased canes.	Remarks
F (Ratoon)	Co.361 ..	Green manurial experiment. Cowpea	11·5%	·7%	2·5%	2·0%	·4%	17·3%	
		Dhaincha	13·9%	·5%	2·8%	2·9%	·4%	20·8%	
		Sunn-hemp	10·1%	·7%	2·2%	·9%	·8%	14·8%	
		Control	9·2%	1·2%	2·4%	·8%	·8%	14·6%	
	Total ..	..	11·2%	·8%	2·3%	·7%	·6%	16·7%	
L.	Co.361 ..	Green manurial experiment. Cowpea	14·1%	2·3%	..	..	..	16·4%	
		Dhaincha	21·6%	1·6%	..	..	..	23·2%	
		Sunn-hemp	15·9%	1·7%	..	..	..	17·6%	
		Control	19·2%	2·1%	..	..	..	21·3%	
	Total ..	..	17·5%	1·9%	..	..	..	19·5%	

Recommended varieties

Variety		Bacterial rot	Red rot (Colletotrichum falcatum)	Rind (Melanconium Sacchari)	Smut (Ustilago Sacchari)	Fusarium top rot	Total per cent.of diseased canes	Remarks
Poj. 2714	..	19·5%	6·6%	·3%	..	..	26·6%	
Poj. 2878	..	16·9%	2·5%	·06%	..	·03%	19·5%	
Co. 290	..	8·0%	1·3%	..	..	..	9·3%	
Co. 313	..	14·0%	3·4%	..	..	..	17·6%	
Co. 361	..	15·7%	1·5%	..	1·2%	..	18·7%	
Co. 421	..	18·6%	·7%	..	..	..	19·3%	
Co. 355	..	12·2%	2·4%	..	..	..	14·7%	
Co. 356	..	25·0%	1·2%	..	..	..	26·3%	
Co. 419	..	6·1%	·6%	·05%	..	..	6·8%	
Co. 408	..	9·9%	1·6%	..	..	·2%	11·9%	
Total	..	12·6%	2·2%	·07%	·1%	·009%	14·9%	

Cercospora Kopkei has become a regular pest in many cane fields in the Assam Valley. The extent of damage due to this disease is not exactly known as yet.

Fusarium moniliforme has been noticed causing appreciable damage in many sugarcane plots. The parties were advised on control.

A severe out break of red rot disease (Colletotrichum falcatum) wa reported from Dibrugarh. The party was advised on control.

20. *Tobacco.*—Some exotic varieties of tobacco were under observation and control. Leafcurl disease appeared at the Jorhat farm. The details of study of diseases in different varieties have been noted below.

The varieties H special, Varginia, H 179 × T S 2 and T S 2 × H 142 suffered from leaf curl disease (Probably mosaic). The extent of damage was 22·7, 22·7 9·0 and 9·0 per cent. respectively. The Motihari and country types suffered very badly from shot hole disease. Bacterial rot was noticed on Pusa 28, selfed TS2, and in 177 × TS2. This was kept controlled by roguing the diseased plants as soon as noticed.

21. *Litchi.*—Some diseased litchi fruits were sent by the Deputy Director of Agriculture, Surma Valley for examination. Penicillium sp. was noticed on the diseased materials and it was reported.

22. *Til.*—(*a*) Rhizoctonia Solani.—A very mild attack was noticed at Jorhat in the early stage of the crop. The diseased plants were rogued out.

(*b*) *Cercospora Sesami.*—A very heavy attack of Cercospora Sesami was noticed at the old stage of the crop.

23. *Cocoanut.*—A case of nut fall was reported from the Sibsagar district. The plants were examined on the spot and some diseased materials were collected in the laboratory for examination. On incubation and culture some non-septate myceli um of Phycomycete group was obtained. This is suspected to be Mahali disease of Madras. The party was advised on control.

24. *Tomato.*—Three varieties of tomato were under observation and study as regards their diseases and yield in relation to different treatments. The result awaits to be noted.

25. *Wheat.*—The rust disease (Puccinia Graminis) was very prominent at Kakilamukh. A varietal observation is required to pick up some suitable varieties for that locality.

26. *Onion.*—The tip burn disease due to Macrosporium Cladesporides was noticed more or less in almost all the onion plots at Jorhat, Kakilamukh and in other places of Sibsagar district. But in no cases the attack was so severe as was noticed in some plots during last year. This may be due to weather condition.

27. *Soybean.*—The different varieties of soybean grown at Jorhat were under study. The result of observation is as follows.

All the varieties except Shillong 9, 6, 5, 3, and 1 suffered more or less from leaf disease.

28. *Groundnut.*—All the varieties grown at the Jorhat experimental plot suffered very badly from Cereospora personata. But the varieties shan (Magura) Cawnpure No. 23 and M. 30/38 were found resistant to the disease.

A large number of enquiries on plant diseases were received during this year. They were timely attended.

Samples of plant diseases and methods of control were demonstrated as usual at Jhanji and Kaliani exhibitions.

The students of the agricultural training classes of both the valleys were given both practical and theoritical training in Mycology and they were examined.

The herbarium was taken care of throughout the year.

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APPENDIX III

ANNUAL REPORT OF THE DEPUTY DIRECTOR OF AGRICULTURE, LIVESTOCK, ASSAM, FOR THE YEAR 1939-40

(R. C. Woodford, Deputy Director of Agriculture, Livestock, Assam)

General

I was on leave from the 12th April to the 2nd October, 1939, after which date I was recalled to duty on the outbreak of the war. During my obsence on leave Mr. L. K. Handique, Senior Marketing Officer, Assam afficiated as the Deputy Director of Agriculture, Livestock, Assam.

The Livestock Section had under it the Upper Shillong Experimental Farm and Dairy, the Khanapara Cattle Breeding Farm, the Sylhet Cattle Breeding Farm and the Cattle Section of the Jorhat Experimental Farm. There were 5 Agricultural Inspectors in charge of 5 circles with headquarters at Gauhati, Barpeta, Jorhat, Silchar and Sylhet. There were also 21 stock men who were in charge of groups of bulls in the Village Breeding Areas and Grazing Reserves and 5 Demonstrators.

There are many signs that the cattle of Assam are improving. This is due mainly to the increasing desire for better cattle amongst the people which has been brought about by the ever expanding education and spread of ideas, the propaganda and demonstration of this and the Veterinary Department, the interest of prominent individuals, and the Viceroy's appeal which led to the formation of the Livestock Improvement Association. A most important source of improvement has been the Mymensinghias. The Mymensinghias bring with them or acquire and breed better cattle. Their system of breeding, feeding and management is superior to the practice obtaining in Assam and the people of the province would do well to copy their methods and acquire cattle from them. The distribution of breeding bulls by this Department is having effect and the steady and annually increasing number of castrations of weedy bulls by the Veterinary Department is raising the standard of cattle gradually but none-the-less effectively.

II. CATTLE BREEDING STOCK

The breeding stock and young stock owned by the Government of Assam (excluding working bullocks) on the 31st March, 1940, were :—

Name	Adult cattle		Young stock and calves	Buffaloes	Sheep	Goat	Total	Remarks
	Cows	Bulls						
1. Upper Shillong Farm	22	2	32	..	124	..	180	
2. Khanapara Farm ..	31	4	77	..	..	44	156	
3. Sylhet Farm ..	44	10	63	15	..	..	132	
4. Jorhat Farm ..	19	12	37	..	..	..	68	
5. Jail Dairies ..	58	8	33	..	..	..	99	
6. Grazing Reserve ..	9	40	10	2	..	..	64	
7. Digboi Livestock Centre	11	6	21	..	..	..	38	
8. Bulls at public service (other than those mentioned above).	291	..	..	..	..	..	291	
9. Sheep and goats issued to villagers.	..	..	..	..	..	23	23	
Total	194	373	273	17	124	67	1,051	

III. CATTLE BREEDING AND OTHER ACTIVITIES IN GOVERNMENT FARMS

(i) *Upper Shillong Farm*

Season.—The season for maize and potato was not favourable owing to early drought followed by heavy rain in May, which was again followed by dry weather in June. The long drought during the spring checked the

germination of crops considerably. A rainfall of 107·95 inches was recorded during the year compared to 105·73 inches of the previous year.

Breeding of Livestock.—Cattle breeding was directed towards high milk production and for this purpose two pedigree bulls, one a British Friesian and the other a Friesian grade, were kept in the farm. At the beginning of the year there were 84 heads of cattle, of which 28 were cows, and at the close of the year there were 71 heads of cattle, of which 22 were cows. The value of cattle on the 31st March, 1940 was Rs. 10,080.

Twenty-one calves were born with an average liveweight of 74·7 lbs. at birth compared to the average liveweight of 73·4 lbs. at birth of the previous year. Three calves died during the year of foot-and-mouth disease, dysentery and Blackquarter. A severe outbreak of foot-and-mouth diseases occurred which caused great loss in milk production and resulted in 4 deaths of adult animals and a weakened herd.

The percentage of cows calved was 84. Twelve adult and young bulls and 8 calves were sold during the year for a total sum of Rs. 1,012-7-0.

The British Friesian bull covered 22 farm cows and 7 outside cows and the Friesian cross bull covered 6 farm cows. The fee for the services of the British Friesian buil was Rs. 5 per cow.

Milk and milk products.—1,71,944 lbs. of milk were produced by farm cows during the year against 1,93,353 lbs. of milk produced the previous year. The decrease of yield was due to an attack of foot-and-mouth disease. 48·4 per cent. of the total yield was sold as whole milk, 10·7 per cent. fed to calves, 24·8 per cent. utilised for ghee making, 12·8 per cent. for butter making, 3·0 per cent. for making cream and ·3 per cent. was lost in handling.

The highest individual yield of milk during the year was 11662·5 lbs. in 365 days by cow No. 59 (Fantacy). The average yield of milk per cow per lactation was 7365·4 lbs. in 388 days against 7020 lbs. in 328 days of the previous year. During the last 11 years the average yield per cow per lactation has risen from 2,500 lbs. to 7,365·4 lbs. The average percentage of fat in mixed milk from these cross-bred cows was 4·4.

Sheep.—At the beginning of the year there were 81 sheep of the Bikanir and Hissardale × Bikanir breed. Fifty-three lambs were born during the year, of which 14 died. Twenty-seven sheep were sold for a total sum of Rs. 145·5 rams and 1 ewe were issued for demonstrations, leaving 96 sheep at the close of the year, valued at Rs. 775.

Shearing of wool was done only once during the year. Fifteen rams averaged 4·83 lbs. of wool, 40 ewes averaged 3·67 lbs. and 10 lambs averaged 1·55 lbs. During the year under report the sheep suffered from foot-and-mouth disease and as a result the output of wool was reduced. The total yield of wool was 235 lbs. 2 oz., all of which was sold.

The 1st and 2nd crosses of Hissardale sheep yielded 20 to 25 per cent. more wool, on the average, than that yielded by the Bikanir sheep. The wool of the Hissardale crosses was also of better length and much finer texture

Ponies.—At the beginning of the year there were 11 ponies, of which 4 were mares, 2 foals were born during the year. One stallion was transferred to the Sylhet Cattle Breeding Farm, one filly was sold for Rs. 40 for breeding and one mare died of an accident. One English × Burma cross stallion was purchased during the year for stud purpose.

At the end of the year there were 11 ponies, of which 4 were mares. These were valued at Rs. 1,335.

Poultry.—At the beginning of the year there were 303 birds, consisting of 180 White Leghorns, 147 Rhode Island Reds, 20 Black Minorcas, 17 Naked Necks, 7 White Leghorn Crosses and 4 Local. Of these, 211 were chicks. An epidemic of fowl cholera accompanied by Ranikhet disease carried off 400 birds. It was unfortunate that I was on leave as the mortality need not have been so high if adequate precaution had been taken.

During the year 11 birds were sold for breeding, 27 for meat and 35 birds were transferred to other farms and districts for breeding.

At the end of the year there were 105 birds, including 40 chickens, valued at Rs. 484.

4772 eggs were laid by poultry of all kinds. The average yields of the different breeds were as follows :—

—	1938-39	1939-40
White Leghorn	116·1	110·5
Rhode Island Red	113·7	103·0

Egg production was reduced owing to the death of many valuable laying hens during the year.

Cultivation of potato.—With the object of introducing superior varieties of potato among the Khasi cultivators about 9 acres of European and local varieties were grown from which an yield of 912 maunds, 11 seers and 8 chhataks was obtained. The following Table shows the yield, etc., from the different varieties :—

Varieties	Acreage	Seed used	Total yield	Average yield per acre	Proportion of yield of seed
		Md. sr. ch.	Md. sr. ch.	Md. sr. ch.	
Talisman '39	0·28	3 30 0	28 16 0	101 17 2	7·5 fold.
Factor '39	0·30	3 30 0	24 32 0	82 26 10	6·6 ,,
Great Scott '37 ..	0·80	27 14 0	93 21 0	116 36 4	3·4 ,,
Epicure '37	0·46	11 10 0	25 24 8	55 27 2	2·2 ,,
Arran Banner '37 ..	1·26	26 11 0	86 5 8	68 14 8	3·2 ,,
Up-to-date '36 ..	1·47	33 20 0	167 6 0	113 28 4	4·9 ,,
Inverness Favourite '36	0·28	6 30 0	30 5 0	107 23 10	4·4 ,,
Arran Consul '36 ..	1·01	19 8 0	105 18 8	104 16 12	5·4 ,,
Italian White Round '36.	0·41	3 5 0	12 38 0	31 23 6	4·1 ,,
Darjeeling '38 ..	2·97	29 21 0	229 32 0	77 14 14	8·1 ,,
Laitlyngkot Pink '38 ..	0·10	1 20 0	12 9 0	122 10 0	8·1 ,,
	9·34	..	..	..	

Growing of fodder crops.—Fodder was grown for making silage and hay. Maize, soybean, Korali (Sataria Glanca), Raishan (Paspalum Sanguinale), Jobs-tears (Coir Lachyrna Coix), Sun-flower (Helian Thus-annus), Blue grass, Kikuyu and local grasses were also grown during the year.

(*a*) *Maize.*—1·5 acres of maize were grown for fodder and 8·35 acres for grains under variety trial with 9 varieties interplanted with 5 varieties of soy-bean.

The statement below shows the yield of the different varieties—

	Average yield per acre					
	Grains			Stover		
	Md.	sr.	ch.	Md.	sr.	ch.
1. Yellow Round (Kalimpong)...	16	0	6	158	15	0
2. Red Round (Kalimpong) ...	17	18	12	164	11	0
3. Pearls (South Africa) ...	20	29	6	162	8	0
4. Golden Beauty (Kalimpong)	14	38	6	133	31	0
5. Suttons Giant (Kalimpong)...	10	19	6	105	36	0
6. Pumankey (American Kalimpong strain).	18	26	0	134	15	0
7. Wood Verginian (American Kalimpong strain).	6	38	12	130	37	0
8. Red Flat (Raliang Khasi Local).	17	4	4	129	15	0
9. White Round (Khasi Local)	8	38	12	133	32	0

(*b*) *Soy-bean.*—Trial of South African, Barmali (Farm), Barmali (Eastern Bengal and Assam), Barmali (Kalimpong), Large White Kalimpong and the Manipur beans were made to see which one would suit our purpose for fodder, grain and green manure. Of these the Barmali (Kalimpong) variety gave the best result with an average yield of 3 maunds, 13 seers and 4 chhataks grains and 16 maunds, 26 seers, 10 chhataks bhusa per acre. The bhusa was fed to ponies.

(*c*) *Korali (Sataria Glanca).*—An area of 11·6 acres was put under this crop. The straw and hay of Korali are relished by cattle. The average green yield of fodder was 98 maunds, 27 seers, 8 chhataks per acre.

(*d*) *Raishan.*—An area of 9·18 was put under this crop. The average green yield per acre was 138 maunds, 22 seers, and 8 chhataks.

(*e*) *Jobs-tears.*—This is a local millet. The grains are used by the Khasi people for food and for making beer. It grows well in *jhum* areas. 1·90 acres of land was under this crop. Of this, 0·15 acres were for grains and 1·85 acres for fodder. It is a promising grain crop. The average outturn of grains per acre was 12 maunds, 13 seers and that of green fodder was 116 maunds and 35 seers.

(*f*) *Sun-flower.*—An area of 7·93 acres of sun-flower was grown for grains, green manuring and fodder. It is a quick growing, heavy yielding and highly nutritious fodder and can be grown successfully all the year round. The result was promising. The crop was fed green to cattle. 4 maunds, 32 seers of grains were collected from 4·63 acres for seed.

(*g*) *Other grasses.*—Blue grass, Kikuyu and local grasses were grown in 221·40 acres, of which 69·5 acres were grazed and 151·90 acres cut. Total yield of grass was 1,832,130 lbs. giving an average outturn of 12,390lbs. per acre.

Of these 7,00,692 lbs. were fed green to cattle, 6,21,790 lbs. used for silage and 5,59,648 lbs. for hay.

(*h*) *Silage.*—7,39,000 lbs. of green fodder was pitted for silage. A rough experiment was carried out this year with grass silage *versus* maize stover silage, in order to arrive at an approximate feeding value of the two commodities.

The changes recorded during the trial are :—

(1) Grass silage registered an increase of 1 lb. of extra milk yield per cow per day.

(2) Fat percentage was higher by 0·09 per cent. during the period when the grass silage was fed.

(3) The butter made from milk produced during the period when maize-stover silage was fed was slightly harder in texture though the colour was yellower.

(4) The wastage of silage in the manger was more with stover than with grass. The experiment will be continued.

(*i*) *Hay-making.*—559,648 lbs. of green grass were cut, which yielded 188,226 lbs. of hay. The average outturn per acre was 12,390 lbs. green.

(*j*) *Cost of production of fodders.*—The production cost of different fodders was :—

	Rs.	a.	p.	
Mixed-grass green	0	1	8	per maund.
Ditto silage	0	3	7	,, ,,
Ditto hay	0	3	6	,, ,,
Maize silage	1	6	10	,, ,,
Jobs-tears silage	0	12	10	,, ,,
Maize stover silage	0	6	11	,, ,,

Experimental crops

(*a*) *Paddy.*—Transplanting of rice is never done on the higher valleys, the crop being always broadcast with the result that a heavy seeding is required. Twelve different varieties of paddy were tried in the farm to find out if it would be possible to substitute transplanting for broadcasting in the higher areas which would result in a saving of at least 75 per cent. of seed. The trials seem to shew that transplanting is not likely to be successful.

(*b*) *Lespedeza (Manchurian Clover).*—This is a legume which has increased with remarkable rapidity in America as a cultivated crop and is highly valued for soil improvement, pasture and hay. Small samples of three of the leading varieties were tried. Germination was quite good and plants were quite healthy and could stand the heavy monsoon rain. Natural reseeding occurred freely. It offers 2 to 4 cuttings annually.

(*c*) *Turmeric, Ginger and Chilly.*—With the object of introducing superior varieties of these money crops in the hills they were grown in this farm for the 1st time. Results of the trial with turmeric will be published next year. Ginger and Chillies proved unsatisfactory at this height (6,000 feet).

Soil conservation measures.—All slopes in the farm were contoured and cultivation was done in contour strips, which will in time become terraces. Trees, shrubs and grasses were planted on the contours. Wood-lots and windbreaks were planted.

(*ii*) *Khanapara Cattle Breeding Farm*

A rainfall of 55·94 inches was recorded in the farm which was less by 4 inches from that of the previous year. Owing to the adoption of control measures advised by the Assam Medical Research Society the incidence of malaria was less than that of the previous year. The breeding policy of the farm continued to be the same as that of the previous year, *i.e.*, to rear a pure Scinde breed for producing acclimatised animals of this breed and to grade up a local herd of cattle by using Scinde bulls.

Cattle.—The year started with a breeding herd of 149 animals and 16 bullocks and closed with 127 breeding animals, 15 bullocks and 2 ponies. There were 29 Scinde, 92 Scinde Cross, 2 Behari, 8 Thaparkar Cross and 34 Local animals.

The total value of the stock on the 31st March 1940 was Rs.6,828 compared to Rs.6,855 of the previous year.

Thirty-four calves were born during the year, the percentage of calving being 103·8, an excellent figure. Seven calves died.

Three adult animals died during the year and 28 were removed due to Johnes disease control measures.

Five cows, 1 bull and 1 bullock were sold during the year. Fourteen bulls were issued for breeding and 2 cows were transferred to the Digboi Livestock centre. Nine bulls were returned to the farm from breeding areas, 1 bull and 1 heifer from Jail Dairies and 2 bulls from the Jorhat Farm.

Five farm bulls served 65 cows during the year. Live-weights of male and female calves of Scinde and Scinde Crosses were taken at birth and one year after birth. The statement below shows the average weight of calves for the past 4 years :—

Breed	At birth				At one year			
	No. weighed	Male	No. weighed	Female	No. weighed	Male	No. weighed	Female
Scinde ..	10	43·96	8	37·26	11	275·68	8	210·5
½ Scinde ..	9	42·96	12	40·66	3	289·33	3	260·44
¾ Scinde ..	37	40·31	35	36·35	21	259·42	16	222·98

Milk Records

The statement below shows the best milk yields during the year 1939-40:—

Brand No. and breed of the cow	No. of days in milk	Total yield in lbs.	Maximum in a day lbs.	Average per day lbs.	Remarks
8 Scinde	357	3,567·5	..	9·99	
155.½ Scinde × Assamese ..	252	2,449·0	..	9·7	
101.½ Scinde × Assamese ..	385	3,573·0	..	9·28	
1.½ Scinde × T.P.Br. ..	296	2,801·5	..	9·46	

The statement below shows the average completed lactation of the cows during the year :—

Breed	No. of completed lactations	Average yield in lbs.	Average No. of days in milk	Remarks
		lbs.		
Scinde	5	2,942·0	343·8	
½ Scinde × Assamese	10	2,431·9	261·3	
¾ Scinde × Assamese	4	1,500·37	204·7	

67,455 lbs. of milk were produced in the farm during the year, of which 19,191 lbs. were fed to calves, 42,328·5 lbs. sold as whole milk and the rest utilised for making *ghee*. The receipts from sale of milk amounted to Rs.2,589-13-9.

Poultry.—Total number of poultry at the end of the year was 76, consisting of 14 White Leghorns, 8 country fouls, 7 Rhode Island Reds, 21 Khaki Campbell ducks, 4 Indian Runner ducks, 9 country ducks and 10 geese.

One thousand five hundred and twenty-three eggs were laid during the year to which fowls contributed 554, ducks 953 and geese 16. One hundred and three eggs were hatched, 1,357 sold, 53 issued for demonstration and 10 were either fed to chicken or broken.

Goats.—At the beginning of the year there were 6 he-goats, 11 she-goats and 10 kids. During the year under report, 8 male and 2 female Jamnapuri × Local cross goats were purchased. Nineteen Barbari and 3 Jamnapuri goats were purchased—the former from the Etah Government Farm and the latter from Karachi. The Etah goats suffered badly on arrival. Pox also broke out among them and 14 died.

Thirty-seven kids were born during the year. Reductions were 16 by death, 10 by sale for breeding, and 8 by transfer to breeding areas. At the end of the year there were 44 goats in stock.

Ten services were given to she-goats of outsiders by the farm he-goats during the year, free of charge.

Fodder.—37·3 acres were under cultivation and 142·9 acres were used for grazing.

The crops grown, their outturn, cost, etc., were :—

Serial No.	Name of crops	Area	Yield per acre green	Cost per 100 lbs.	Remarks
		Acres	lbs.	Rs. a. p.	
1	Kharif Jowar	5	19,065	0 2 0	
2	Cow-pea	3·5	8,457	0 3 6	
3	Napier Grass on hills ..	..	12,000	0 2 1	
4	Guinea Grass	25·5	37,506	0 1 8	
5	Mixed Local grass	..	7,384	0 3 5	

Sugar-cane.—From the ratoon crop, over 20,000 setts were obtained and replanted for 1940-41.

Silage.—Surplus green fodders after feeding the cattle, were made into silage. 4,68,630 lbs. of green fodder were turned into silage for feeding the farm cattle and the cost of making it came up to Re.0-2-5 per 100 lbs.

Grass roots.—Four hundred and eighty-five baskets, contaiaing 100,000 grass roots, were supplied during the year for demonstration and sale in the districts. Five hundred pine apple suckers were issued.

(*iii*) *Sylhet Cattle Breeding Farm*

The object of this farm is to maintain a herd of pure acclimatised Scinde cattle and Murrah buffaloes and to grade the herd of local cattle by using Scindi bulls. Special attention is paid to high milk yield under plains conditions.

Season.—The season for monsoon fodder crops was not favourable owing to heavy and continuous rainfall at the beginning of the year. The total rainfall amounted to 140·77 inches in 166 days during the year compared to 177·77 inches in 162 days of the previous year.

The year started with 124 animals and closed with 151, consisting of 50 cows, 11 breeding bulls, 18 bullocks, 71 young stock and calves and 1 pony. The total value of farm animals on the 31st March 1940 was Rs.6,526 compared to Rs.5,891 of the previous year. Forty-six calves, including 5 buffaloe calves, were born during the year, of which 5 calves died of various diseases. Nine bulls and 1 pony were received during the year from the Agricultural Inspector, Livestock, Sylhet and the Upper Shillong Farm respectively. Only 1 bull was issued during the year. Eight animals died during the year and 19 were removed under Johnes disease control measures.

Seven bulls, including 1 buffalo bull, were kept for breeding which covered 62 farm cows and 33 outside cows during the year against 59 farm and 52 outside cows served during the previous year.

Production of milk.—1,06,907 lbs. of milk was produced by farm cows during the year against 83,286 lbs. of the previous year. Of this quantity, 27,648 lbs. were fed to calves and 79,259 lbs. sold as whole milk. The highest individual yield recorded during the year was 6,153 lbs. in 366 days by Scinde cow No.104 (Sukriti). A half Scinde × Local Cross cow No. 102 (Khana) yielded 3,906 lbs. in 290 days.

The average yield per cow of different breeds recorded during the year was:—

Breed	Milk in lbs. average yield	Number of days	Average yield per diem
		Days	lbs.
Scindi	3,377·1	263	11·7
½ Scindi	2,153·5	252	8·3
T. P. Cross	1,081·7	160	6·6
Local Mixed	1,105·1	192	..
Buffaloes	3,197·0	272	..

The percentage of cows calved during the year was 82 compared to 64 of the previous year.

Green fodder was cut and fed to cattle as green according to requirements. All surplus fodders, except Rabi crops, were made into silage. The permanent crops, such, as, Napier and Guinea grass, gave good results.

Silage.—The statement below shows the quantity of silage made from different crops:—

Name of crop	1939-40	1938-39	Remarks
	lbs.	lbs.	
Maize	26,420	81,174	
Juar	22,338	61,182	
Mixed grass..	138,214	250,384	
Maize with Cowpea	..	10,800	
Guinea	..	26,892	
Total ..	186,972	430,432	

Distribution of grass roots.—During the year under report 14,000 clumps of Napier and 5,500 clumps of Guinea grass roots were supplied to the public through the district staff of this section.

Fodder.—A total area of 39·91 acres were under cultivation with perennial grasses and fodder, the detail of which is shown below. Para. grass is proving itself a valuable fodder for this wet climate and its cultivation will be expanded.

Names of crops (Monsoon) Annual	Area in acres	Yield in lbs.			Average yield per acre in lbs.			Cost of productions per 100 lbs.	Remarks
		Green	Grain	Straw	Green	Grain	Straw	Rs. a. p.	
Maize	4·36	26,420	..	..	6,059	....	..	0 5 0	
Jowar	4·29	22,700	..	..	5,291	..	..	0 3 7	
Soyabean	2·42	12,972	..	..	5,360	..	..	0 6 2	
Cowpea	3·50	20,852	..	..	5,957	..	..	0 4 9	
Sali paddy	7·00	..	18,768	14,520	Done on share system ¼ grain and whole straw.				
Aus paddy	1·00	..	620	160	..	620	160	..	
Sali paddy	0·25	..	896	440	..	3,584	..	0 12 10	
Annual winter									
Peas	6·50	59,986	..	..	8,767	..	..	0 4 0	
Shalu Jowari ..	1·00	7,350	..	..	7,350	..	..	0 6 2	
Oats	1·25	10,200	480	800	8,160	..	..	0 3 9	
Matikalai	2·00	5,546	670	..	..	335	..	0 5 9	
Perennial									
Napier grass.. ..	3·09	1,05,674	..	..	34,198	..	..	0 6 9	
Guinea grass ..	2·00	60,724	..	..	30,362	..	..	0 7 3	
Para grass	1·25	43,712	..	..	34,969	..	..	0 2 9	
Local Mixed grass ..	..	4,31,964	..	..	..	..	..	0 1 3	

Local grasses, called Rema and Tallia (which grow on poor tilla soil), and tree fodder were also used.

Ducks.—Twenty-two ducks were issued to the district staff as they did not do well in this farm.

(IV).—CATTLE SECTION OF JORHAT EXPERIMENTAL FARM

With the object of rearing a grey herd of cattle suitable for the grazing reserves and for grading up the *Behari* and *Murangia* breeds of cattle, bulls of *Tharparkar* and Hariana breeds were used in the post. This farm now has its own type called the Jorhat Grey and uses suitable farm bred bull for breeding.

At the beginning of the year the herd consisted of 69 animals, of which 16 were cows, 7 bulls and 46 youngstock. At the close of the year there were 68 heads of the cattle, of which 19 were cows, 12 bulls and 37 youngstock. These were valued at Rs.3,314 compared to Rs.2,371 of the previous year.

Ninteen calves were born during the year, of which 5 were male and 14 female, with an average live weight of 47 lbs., and 40 lbs. respectively compared to 43 lbs. and 42 lbs. of the previous year. Twelve calves died due to various causes. Four adult animals died during the year of various diseases.

Four bull calves and 1 cow were received from the Jorhat Jail, 2 bulls returned to the farm from district work and one was received by gift.

One cow, 1 heifer and 2 bulls were sold during the year. Eight bulls were issued to different localities for breeding. The total quantity of milk produced during the year was 23,567 lbs. of which 13,015 lbs., were sold as whole milk, 9,127 lbs. fed to calves, 14½ lbs. lost in handling and 1410·5 lbs. were colostrum.

The highest individual milk yield during the year was 3,924 lbs., in 251 days by cow No. 32 (half *Tharparkar*). The average yield per completed lactation was 1,546·9 lbs., in 159·8 days.

Farm bulls covered 23 farm cows and 16 outside cows during the year.

Poultry.—At the beginning of the year there were 3 cocks, 10 hens and 54 chickens of the Rhode Island Red breed. During the year 1 Rhode Island Red cock and 3 Local hens were purchased.

During the year 3 cockerels, 9 hens of the Rhode Island Red breed and 3 local hens died of various diseases. 10 cockerels were issued to villages and 2 sold for table.

Eight hundred and seventy eight eggs were laid by farm hens during the year, of which 74 were hatched, 770 sold and 25 fed to chicken, leaving 9 at the close of the year.

The total number of poultry at the close of the year was 38, consisting of 3 Rhode Island Red cocks, 19 hens and 16 chickens and were valued at Rs.58.

Summary.—On the 31st March 1940 there were 116 cows, 28 bulls, 209 youngstock and 15 buffaloes in the cattle breeding farms. During the year under report 23 bulls, 16 cows and 11 youngstock were sold or issued from these farms, bringing the total issue and sale since the beginning of the cattle improvement work in the province upto 31st March 1940 to 294 bulls, 223 cows and 131 youngstock. Farm bulls served 64 cows of the public during the year.

IV.—JAIL DAIRIES

Supervision of jail dairies, including the dairy at the Tezpur Mental Hospital, was continued during the year.

The following statement shows the number of jail dairies and the cattle maintained therein on the 31st March 1940 :—

Name of jail	Adult animals		Young stock under 3 years and calves	Total	Breed	Remarks
	Bulls	Cows				
Sylhet	1	10	8	19	Scindes.	
Silchar	1	7	11	19	Scindes and Friesian crosses.	
Gauhati ..	1	11	15	27	Scinde.	
Dibrugarh ..	1	5	5	11	Scindes.	
Jorhat	1	7	11	19	Scindes.	
Tezpur	1	11	12	24	Ditto.	
Tezpur Mental Hospital.	2	7	10	19	Ayrshire and Friesian crosses.	
	8	58	72	138		

The following animals were returned from jails :—

Name of jail	Details of cattle returned.	Place to which transferred	Reasons for return	Remarks
Sylhet	2 male calves	Sylhet Farm	For rearing	
Silchar..	..	..	..	
Jorhat	1 cow, 1 male calf.	Jorhat Farm	For rearing	
Tezpur..	1 Male calf 1 Female calf.	Khanapara Farm.	For rearing	
Gauhati	..	..	..	
Dibrugarh	3 young bulls.	Jorhat Farm	For rearing	
Tezpur Mental Hospital..	..	..	..	

During the year no supplies were made to jails, which are now able to breed their own cows, 100 cows belonging to the public were served by jail bulls.

V.—THE LIVESTOCK IMPROVEMENT CENTRE, DIGBOI

In this centre the Assam Oil Company maintained 11 cows and 6 bulls, supplied by Government, at their own expenses. Twenty-two youngstock, all of which were Scinde crosses belonging to the Company, were reared. The Company employed Livestock Inspector and operated a carefully organised plan for the improvement of local cattle. Two grazing grounds have been cleared and fenced, where only cows are admitted with 6 Government bulls which served 231 cows during the year. A small farm has been built and cultivation of Napier grass and other fodder is done.

VI.—BREEDING BULLS FOR PUBLIC USE

The year started with 377 Government bulls and closed with 373. These bulls covered 8,336 cows (as recorded) compared to 5,160 cows served during the previous year. The number of unrecorded services would approximate at least 25 per cent. of the total, as many of the bulls were allowed to run free in unattended local herds. The estimated total number of cows served therefore, would come to 10,000.

The number of calves born to Government bulls, seen and recorded, was 3,401 compared to 2,507 of the previous year. About 20 per cent. more calves remained untraced either due to their hiding by the owners or due to their being born to cows of distant villages.

The staff of this section castrated 1,084 bulls during the year of which 804 were in grazing reserves.

Twenty eight Government bulls were maintained at the Government Farms and Jail Dairies, which were available for public use and they served 217 cows during the year.

In addition to Government bulls there were a number of bulls of the Livestock Improvement Association, most of which were placed in the breeding areas or near Government bulls. The Association had, at the end of the year 133 purchased, 159 donated and 299 private owned bulls registered with the Association. These bulls covered 4,443 cows during the year.

VII.—VILLAGE BREEDING AREAS

There were 28 village breeding areas during the year with 268 Government bulls working in them.

(i) The following statement shows the details of the Groups :—

Name and district of village area	No. of bulls in the group	No. of cows served in the group, recorded	No. of calves born to Govt. bulls, recorded	Remarks
Palashbari-Kamrup ..	12	227	115	
Kurua-Kamrup	11	476	352	
Jakhalabanda-Nowgong ..	8	208	83	

Name and district of village area	No. of bulls in the group	No. of cows served in the group, recorded	No. of calves born to Govt. bulls recorded	Remarks
Nagsankar-Darrang ..	8	183	4	Started in March 1939.
Roha-Nowgong	11	140	..	Started in September 1939.
Nalbari-Kamrup	13	426	232	
Kokrajhar-Goalpara ..	12	261	176	
Sorbhog-Kamrup	11	177	48	
Pathsala-Kamrup	5	29	7	New group.
Kachugaon, Sapatgram, Agomani, } Goalpara ..	5	144	70	
Jhanji-Sibsagar	14	371	199	
Digboi-Lakhimpur.. ..	6	231	10	
Misamora-Dergaon, Sibsagar	13	383	76	
Khowang (Sibsagar) ..	11	153	..	
Panitolla (Lakhimpur) ..	6	New centre	..	
C. O. ..	146	3,409	1,372	
Silchar-Cachar	13	437	178	
Lakhipur-Cachar	12	420	174	
Katigorah-Cachar	5	125	44	
Hailakandi-Cachar.. ..	18	694	284	
Dullabcherra-Cachar ..	12	455	459	
Sylhet-Kulaura	11	621	182	
Sylhet-Maulvibazar ..	11	436	103	
Habiganj	11	477	33	
Chunarughat	6	88	..	Withdrawn in December 1939.
Sylhet	12	315	17	
Chatak	11	24	..	Ditto.
Total ..	268	7,501	2,846	

In order to ascertain the health and growth of bulls in breeding areas at different ages under village conditions, heights and weights of all Government bulls under the Agricultural Inspector, Livestock, Sylhet were taken every 3 months, the results were as follows :—

Area	1939-40			1938-39		
	Average age of bulls	Average height of bulls	Average weight of bulls	Average age of bulls	Average height of bulls	Average weight of bulls
Habiganj ..	5½ years	46½ inches	616 lbs.	3¾ years	46 inches	572 lbs
Kulaura ..	4 year 8 m.	46 ,,	530 ,,	3½ ,,	45 ,,	493 ,,
Maulvibazar	6 years	47½ ,,	690½ ,,	4½ ,,	46 ,,	521 ,,
Sylhet ..	4 ,,	46½ ,,	507 ,,	3¼ ,,	46½ ,,	508 ,,

(*iii*) In order to find out whether the use of Government bulls improved the size of the village cattle, live-weight of calves born to Government bulls and local bulls were taken at 7 days, with the following results :—

Area	Calves born to Govt. bulls average weight	Calves born to local bulls average weight	Remarks
Upper Assam ..	23 lbs.	18 lbs.	
Silchar	35·0 ,,	26·0 ,,	
Dullabcherra ..	32·5 ,,	28·2 ,,	
Katigora	25·0 ,,	21·3 ,,	
Lakhipur	32·1 ,,	28·2 ,,	
Hailakandi ..	29·0 ,,	22·2 ,,	

(*iv*) *Diseases and Casualties.*—The bulls in the village areas maintained good health in general. The bulls of middle Assam and Chattak suffered for a time due to shortage of fodder. Some bulls of both the valleys suffered from foot-and-mouth disease and Rinderpest, but due to adoption of prompt

measures all of them survived. Worm doses were continued in both the valleys through out the year.

List of casualties during the year :—

Area	No. of bulls died	Causes of death	Remarks
Lower Assam ...	1	Old age.	
Ditto	2	Black quarter.	
Ditto	1	By accident.	
Middle Assam ...	1	Haemorrhagie Septicimia.	
Ditto	1	Injury.	
Ditto	1	Killed by tiger.	
Ditto	1	Unknown disease.	
Silchar	2	Haemorrhagie Septicimia.	
Ditto	1	Anthrax.	
Sylhet	4	Due to old age and other diseases.	
	15		

It will be seen that out of total 268 bulls issued to village areas during the year only 15 died, of which 3 died of accident. The percentage of death is less than 4, which was exceptionally good considering the various epidemics and diseases to which they are exposed under village conditions. The casualties were replaced.

VIII.—NOTIFIED GRAZING RESERVES

There were five Grazing Reserves under the control of this section during the year. The total area covered by these reserves was 40,000 acres and they contained about 12,512 heads of cattle, which were showing marked improvement year after year. Cattle born in these areas were in great demand and were fetching good price. During the year under report 18 bulls of improved strain and size were purchased by this section from the reserves for placing them in village breeding areas and tea gardens. No new reserve was notified during the year.

The statment below shows the area and cattle population of the five reserves mentioned obove :—

Name of Reserve	Area	Number of cattle under control
1. The Aie River Forest Reserve (Goalpara).	12,400 acres	2,500
2. Barpeta Professional Grazing Reserve (Kamrup).	4,600 ,,	1,480
3. Lanka Professional Grazing Reserve (Kamrup).	8,000 ,,	750
4. Subankhata-Pakhamara Grazing Reserve (Kamrup).	12,000 ,,	6,832
5. Burachapuri Grazing Reserve (Darrang).	3,000 ,,	950
	40,000 ,,	12,512

Youngstock under 2 years are not included in the above statement.

Details of work done in the Grazing Reserves are given below :—

(1) *The Aie Forest Reserve.*—In this reserve a stock-man was put in-charge of the Government cattle, who kept the records of services and calves born and also carried out castration. At the close of the year there were 13 Government bulls, which served 624 cows and 259 calves were born to them, of which 78 died of various diseases.

Total number of youngstock (born to the Government bulls) in this reserve during the year was 780.

Eighteen breeding bulls were purchased by this section from this reserve.

Hariana cows continued to do well in this reserve and their offsprings were quite healthy and less susceptible to diseases. Four pure Hariana bulls, bred and reared in the reserve, were working as breeding bulls. The pure herd of Hariana animals consisted of 19 heads at the close of the year.

Altogether 428 undesired bulls were castrated by the Veterinary Assistant Surgeon and the Stockman during the year.

Of all diseases, a form of pneumonia took the heaviest toll of graziers' cattle, causing the loss of 480 heads out of the total of 621 deaths in the reserve.

Government cattle were kept up on green fodder for about half the year, which attracted the attention of the graziers.

(2) *Barrapetta Professional Grazing Reserve.*—A Government Stockman resided in this Reserve. There were 21 Government bulls in the reserve, which served 183 cows and 173 calves were born to them, of which 46 died of various diseases.

Excluding calves, there were 166 youngstock in the reserve. There was also one Government buffalo bull, which was transferred to the Khanapara Farm on the 7th November 1939 after giving 25 services.

There were 2 he-goats, which gave 98 services and 75 kids were born to them.

Weedy bulls were castrated by the Veterinary Department. The number of castrations done is not known to this Department.

Four hundred and fifty-two heads of animals were inoculated against Rinderpest during the year under report. No death occurred from this disease.

Demonstrations of jowari cultivation and silage making were carried out in the reserve and the graziers were attracted by them. They have taken up the cultivation of *Guinea*, *Napier* and *Para* grass and fed the grasses to their own animals.

(3) *Subankhata-Pakhamara Grazing Reserve*.—Six thousand eight hundred and thirty-two heads of cattle grazed in the reserve during the year.

A Stockman resided there.

There were 9 Government breeding bulls and they served 102 cows during the year. Two hundred and sixty-four undesired bulls and 38 goats were castrated during the year under report.

Four plots of improved fodder crops were demonstrated in the holdings of the graziers to impress upon them the utility of such crops in feeding the cattle.

(4) *Lanka Professional Grazing Reserve*.—Scarcity of water has now been removed in this reserve by erecting a new bund. With the provision of water-supply, the *khutiwalas* have been greatly attracted to reside in the reserve.

Only one Government breeding bull was working in the reserve, but 6 very good local bulls (offsprings of Government bulls) were also serving there. Eight Government cows and heifers were kept in the reserve during the year. Fifty-six calves were born to the Government bull during the year.

Napier, *Guinea* and *Para* grasses were grown in the reserve to demonstrate their use as fodder. *Matikalai*, mustard, paddy and maize also were grown on a large scale and the grain and fodder were available for the *Khuti* cattle.

(5) *Burachapuri Professional Grazing Reserve*.—This reserve being surrounded by the river Brahmaputra on all sides is not very suitable for our purpose as the area is often inundated by flood water. In the year 1938-39 there was a great flood which has promoted the growth of weeds instead of grass in the area.

There were about 950 adult cattle in the area, most of which were Maurangia and *Khuti* cross. Five Government breeding bulls were working in the area during the year, while another bull died of an attack from a tiger after working for nearly 6 months. The total number of cows served by them was 156. One hundred and twelve undesirable bulls were castrated. *Para* grass did well.

Summary of work in Reserves

There were 40 bulls, 9 cows, 10 youngstock and 2 buffaloes belonging to Government in the reserves named above. Recorded services performed and calves sired were 1,065 and 488 respectively. Unrecorded services and births were probably as high as 50 per cent.

IX.—FODDER AND GRAZING

The Imperial Council of Agricultural Research has organised a Central Fodder and Grazing Committee and has asked all the Provinces to organise Provincial Committees. Very little work has been done in this direction in this province.

The Livestock Section continued to carry out demonstrations on the growing of fodder crops and grasses, using *Napier* grass, *Jowari*, maize, *soya* bean, *Para* grass and aquatic grasses. One hundred and fifty-seven fodder gardens were organised in cultivators' fields compared with 49 gardens organised in the previous year. About 2 lakhs of roots of *Napier* grass were distributed. While we find great reluctance on the part of cultivators to adopt the practice of growing fodder we are persevering with our propaganda and demonstrations knowing that in time they will come to it.

For water-logged areas *Para* grass was found to be promising as it grew like an aquatic grass (such as '*Jhara*' or '*Uridal*') and did not need as much cultivation as *Napier* grass. It would grow in unused paddy land.

The question of improvement of grazing land presents great difficulties. The two most important factors, *i.e.*, (*i*) controlling the number of grazing cattle and (*ii*) giving periods of rest from grazing so that the grass can recover itself, are entirely disregarded by cultivators. They seem to be quite ignorant of the importance of these two factors. Control of common public grazing grounds seems almost impossible. Yet some day it must be attempted if any improvement is to be brought about. The subject has been neglected in India and it is difficult even to obtain a grass seed mixture for sowing in grass lands to replace poor quality grasses or to follow a crop.

We hope to follow some lines of action suggested by the Central Fodder and Grazing Committee of the Imperial Council of Agricultural Research in future years.

Silage.—We believe that silage making as a method of storing surplus green fodder of the monsoon for use in the dry season has a great future. We have used the method in all our farms for many years and we make a few demonstrations in villages, although hitherto we have not been able to persuade cultivators to adopt it.

Fourteen demonstration pits were made (compared with 11 in the previous year), 6 in the Assam Valley and 8 in the Surma Valley, using all kinds of green fodder, including local grasses.

Aquatic grasses.—In wet low lying areas we are advocating the use of the local aquatic grasses and the imported *Para* grass. In order to produce roots of the grasses and gain experience in their growth and use this section grows them in an area of about 5 acres at Pukra near Habiganj.

Eight grasses have been retained there as being useful, and 6 other grasses have been tried and discarded. *Jhara*, *Arial*, *Parua*, *Tendera*, *Keja Chaulia*, *Ghara Ghai* and finally *Para* grass are under trial. Reaction under water rises are recorded and records of growth and flowering are kept. Growth during the dry season is also observed and the number of possible cuttings examined.

The yields obtained are shown in the following statement. It will be seen that *Para* grass stands well above the others in yield and number of cuttings. *Para* and *Keja* are the most promising for winter or dry season production. *Jhara* and *Arial* made good hay.

Table showing the yields of grasses in lbs. per acre of different grasses on different level

Name of grasses	Arail		Jhora		Parua		Ghara Ghai	
	High land	Low land	High land	Low land	High land	Low land	High land	Low land
Maximum water level attained in the rainy season in feet.	7′—7″	9′—2″	7′—7″	9′—2″	7′—7″	9′—2″	..	7′—8″
TREATMENT								
One cutting	20,637	24,630	27,702	33,403	52,128	26,557	..	21,600
Two cuttings	23,328	21,093	25,428	55,641	36,819	46,893	..	25,396
Three cuttings	Could not be obtained							
Four cuttings	Ditto ditto							

Name of grasses	Tendera		Para		Keja	Chaulia
	High land	Low land	High land	Low land	Low land only	Low land only
Maximum water level attained in the rainy season in feet.	2′—1″	10′—1″	2′—1″	10′—1″	7′—8″	7′—8″
TREATMENT						
One cutting	18,243	..	16,470	7,801	4,747	10,080
Two cuttings	32,688	..	31,493	29,018	21,993	10,080
Three cuttings	Could not be obtained			39,905	34,673	Damage by insect pest.
Four cuttings	Ditto ditto			59,711	..	

Seventy-nine baskets of *Para* grass roots were issued to the district.

Experiment with Para *grass at Karimganj rice breeding station*

Para grass was planted by two methods—(*a*) thickly over the field and (*b*) in lines and also in *aus* land and in low-lying *sail* land. Records of outturn were kept and would be continued.

X.– POULTRY

The Rhode Island Red and White Leghorn breeds of poultry were maintained at the Government Farms at Upper Shillong, Khanapara and Jorhat. From these farms village breeding areas were supplied with eggs and birds for distribution. Information about the performances of these birds will be found under Section III of this report.

Cockerels and a few hens were distributed from the farms to selected centres in villages. The centres were near Jhanji and Dergaon in Sibsagar district, Palasbari in Kamrup, Salmarha in Nowgong, Meherpur in Cachar and Sibganj in Sylhet. About 60 pure cockerels were breeding in these centres at the end of the year and about 1,000 cross-chicken were reported alive.

There were great losses everywhere due to epidemic diseases. In the Upper Assam area the epidemic swept away almost the entire stock in Jhanji and Rajai Naharpuli centres. These deaths severely checked the work, yet much good was done and the villagers as well as middle class people were keenly interested in the work. Good prices were obtained from cross birds and eggs from cross hens. Cross birds fetched Re. 1-8-0 to Rs. 2 each and eggs were also sold at a high price. The price obtained in the Upper Assam Valley was treble than that obtained in the Surma Valley.

More attention is being paid to duck breeding in the Surma Valley. The work was continued at the Pukra grass plots, near Habiganj. The khaki Campbells were discontinued at the beginning of the year and the birds were distributed in the village areas. After a trial of this breed under local condition it was found that they did not thrive well. It would be better to try to improve the local types by selection. Three types of local ducks have been selected, which have been name the white-breasted Nageswari, the Sylhet Mete and the Large Cachar Nageswari. By recording egg production and body-weight the best birds for breeding and rearing ducklings would be found out.

The White breasted Nageswari.—This type has a white throat and breast with a black back, and lays blue eggs. The size is medium. At the beginning of the year there were 16 birds, of which 3 died. At the end of the year there were 34 birds in all-true to the type. These were all kept for breeding purposes in future. Three adult ducks began laying eggs in May 1939 and another 7 pullets from October onwards. The records of three adult ducks were 116, 126 and 136 eggs respectively. One bullet (No. 6) laid 82 eggs in 6 months. We are very hopeful that from this excellent foundation we can develop a good laying breed. 72 eggs set for hatching produced 62 ducklings, *i.e.*, hatchability was 86·1 per cent. The weight of eggs from adult ducks varied from 1·75 oz, to 1·82 oz. Live weight of adult ducks varied from 3 lbs., 1oz. to 3 lbs. 8 oz. in females and 3 lbs. 5 oz. to 3 lbs. 7 oz in males.

The Sylhet Mete.—This type is khaki and black speckled medium in size, laying a white egg. It is really the ordinary village duck. There were 13 birds at the beginning of the year, during which 4 birds were sold and 7 purchased 4 ducklings were also added to the stock and at the year ended with 20 birds, all very carefully selected. Three adult ducks laid eggs throughout

the year except for moulting in July and August. These ducks, No.11, 12, and 13, laid 93, 115 and 134 eggs respectively. Nine pullets came into lay during the year, some of which are very promising. No. 15 laid 79 eggs in 5 months. The weight of eggs from adult ducks varied from 1·5 oz. to 1·76 oz. The live weight of adult ducks varied from 3 lbs. 2 oz. to 3 lbs. 14 oz. in females and the same in males.

Large Cachar Nageswari.—During the year under report another type of duck was introduced from the Cachar District. The type is noted for its large body. It lays bluish eggs. In September and December, 1939, 12 ducks and 2 drakes were received. Out of the 12 ducks, 6 laid white eggs and the rest bluish ones. The ducks laying white eggs were transferred to "Sylhet Mete" group. One drake died during the year. The year closed with 1 drake, 6 ducks and 11 ducklings. The ducks (6) laid 204 eggs for 5 months—the highest number being 62 from the duck No.26 in 5 months of the year. It is too early to comment on this type now. The average weight of the ducks was found to be 1 seer, 11⅛ Chhataks. Nineteen eggs were set for hatching and 11 ducklings emerged. The percentage of hatching was 57·8 and the average period for hatching taken was 28 days.

General Observation.—(*a*) All breeds of ducks kept at Pukra showed marked disinclination to turning broody. This was perhaps due to regular habits, liberal feeding and plenty of out-door exercise. Only 2 birds (Nos.11 and 17 Sylhet Mete) showed a tendency to go broody for a very short period.

(*b*) All breeds began moulting at the same period in the last part of June, but White Breasted Nageswari and Sylheti Mete started moulting in the 1st week of August and finished in the middle of September with an exception in case of duck No.13 (Sylhet Mete) ; it started moulting from the 9th July 1939 and completed it on the 31st August 1939.

(*c*) The best hatching season in Pukra proved to be from the middle of March to Middle of May.

(*d*) Free range for 5 to 6 hours in a day proved best for the ducks. Yield of eggs and health of birds are there by increased and cost of food is lessened.

(*e*) We are using thatched sheds. It is important to provide 'machans' for nests so that ducks can rest free from damp.

(*f*) In addition to grazing, ducks are given a mixture of rice and mati-kalai and dry paddy. Salt and lime are added.

(*g*) Each drake was allowed 4 or 5 ducks and each drake was penned with his ducks for a period in the morning and evening. During the period of free grazing and exercise drakes were separated. Ducks prefer to mate in water, but control is difficult in that condition, hence mating was done on land.

(*h*) Selective breeding from the best layers was begun. All birds were individually numbered and each laying bird was provided with a separate laying nest.

XI. GOATS AND SHEEP

Goats.—As mentioned in the last year's report, the demand for improved goats is widespread. Goat breeding has, therefore, been started at the Khanapara Farm, based on the principle of grading up local goats by the use of Jamnapuri males. Detail will be found in the report on that farm under section III of this report.

In the districts, improved male goats are being issued from the Khanapara Farm and by purchase from up-country. At the end of the year under report there were 23 male goats under the Agricultural Inspectors, Livestock. Reports shew that these goats served about 1,000 females and over 500 progeny were counted. In one case, near Habiganj, 2 cross female goats were seen yielding about 1 seer of milk each daily. Arrangements are being made for a large increase in this work.

Sheep.—The progress of the flock in the Upper Shillong Farm is reported in the Farm report under section III of this report. Sheep issued to the plains from Shillong died soon, in nearly all cases, but in the hills they did well. The farm breed is being spread in the Khasi Hills and an extension to the Naga Hills has recently been made. Twenty-six sheep were issued. As compared to goats, sheep are not important in the plains of this province.

XII. LIVESTOCK IMPROVEMENT ASSOCIATION OF ASSAM

During the year under review, I continued as the Provincial Joint Secretary (*ex-officio*) of the Association, except for the period of my leave when Mr. L. K. Handique acted for me.

The total membership of the Association was 109 on the 31st December 1939 compared to 814 of the previous year. The members gradually fell out of the list by stopping the payment of annual subscriptions. The cause of this decrease has been fully dealt with in the annual report of the Livestock Improvement Association published separately.

During the year under report, the Subdivisional branches of the Association controlled 133 purchased, 159 donated and 299 registered bulls. They served 4,443 cows, but many other services, probably more than the above number, could not be recorded as most of the bulls ran with the herd.

The total donations and subscriptions during the year amounted to Rs.145-2-0.

Owing to shortage of funds and consequent reduction of activities, 4 Stockmen were discharged, leaving only 4 to maintain the records, etc., in the breeding centres under the Association.

Owing to the reduction of subscribing members due to public appeals for funds for other objects, such as the anti-tuberculosis campaign, flood relief, and now for war, the activities of this Association will be very much restricted in future.

XIII. CO-OPERATIVE MILK SOCIETIES

(1) *Gauhati Milk Societies Union Limited.*—The Union had 4 affiliated working societies supplying milk to it. Milk produced in the Khanapara Farm was also sold through this Union. The Union's sale proceeds amounted to Rs.8,394-4-9 compared to Rs.7,886-8-6 of the previous year. It handled 102616 lbs. of milk during the year compared to 79790 lbs. of the previous year. The net working profit was Rs.431 during the year. The financial position of the Union is sound. The attached statements show the financial working of the Union and of the primary societies. All of them earned profits and are in a sound condition.

The Agricultural Inspector, Livestock, Gauhati act as the *ex-officio* Managing Secretary of the Union. The control of the working of the Union is vested in a Managing Committee, consisting of representatives from the Societies. This Union, alone of four unions or groups of these milk societies organised in the Province, has succeeded. All others have failed financially, except the Karimganj Group which still continues with difficulty.

Working of the Gauhati Milk Union Limited for 1939-40

Receipts	Rs.	a.	p.	Expenditures	Rs.	a.	p.
1. Price of coupon books sold out... ...	2,932	2	0	Price of milk paid	5,670	5	9
2. Milk sold on bills	4,302	15	9	Pay of establishment	1,702	9	3
3. Cash sale of milk	323	6	6	Member's attendance at meeting ...	14	0	0
4. " " Curd	708	15	9	Commission to the Manager's of the Societies	258	9	0
5. " " Ghee	71	15	6	Boat hire	42	0	0
6. " " Cream	5	2	3	Municipal tax	43	14	0
7. " " Butter	0	3	0	Refund of Coupons	10	4	3
8. " " S. Curd	49	8	0	Miscellaneous expenditure	179	4	6
				Court fees etc., ...	28	6	0
				Furnitures etc., ...	14	0	0
Total	8,394	4	9	Total	7,963	4	9
				Profit (if any) ...	431	0	0
				Grand Total... ...	8,394	4	9

Statement showing the general position of the Milk Societies, Gauhati, 1939-40

Serial No.	Name of the Milk Societies	Date of registration	No. of members	Supply	Value of supply	Reserve fund	Share capital	Profit during 1939-40	Profit during 1938-39	Remarks
				lbs.	Rs. a. p.	Rs. a. p.		Rs. a. p.	Rs. a. p.	
1	Kurua Co-operative Milk Society	27th Nov. 1930.	25	28,647	1,591 6 9	352 12 3	125	145 14 0	57 1 3	
2	Kajali ditto ditto ..	22nd Jan. 1931.	12	13,944·5	696 15 3	216 5 6	60	60 0 0	24 3 3	
3	Bhatikurua ditto ditto ..	28th Aug. 1935.	25	17,981·5	998 15 6	62 1 6	125	73 6 9	46 9 3	
4	Hathibogra ditto ditto ..	22nd Dec. 1935.	13	8,477	424 1 3	27 0 6	65	45 4 0	16 8 0	
5	Bonda ditto ditto ..	9th Sep. 1930.	10	..	..	89 2 0	50	..	..	No work.

(2) *The Karimganj Group.*—Out of 3 societies one continues to supply milk. One hundred and thirty-seven maunds, 12 seers of milk were sold at a value of Rs.581-0-0.

(3) *Sylhet and Silchar Group.*—The Sylhet Milk Union and the societies of the Sylhet and Silchar groups are already, or about to be, put into liquidation.

XIV. SHOWS AND PROPAGANDA

This section participated in the agricultural and cattle shows held at Jhanji, Digboi, Salchapra, Silchar, Jagadispur, Mutukpur, Tajpur and Sahpur Kamrup.

Lantern lectures on cattle breeding, fodders and milk were delivered at 9 places in the Sylhet District, at which about 2,700 people attended.

In order to get lantern lectures delivered properly it is necessary to have two special Demonstrators, with aptitude for the work, one for each valley. Otherwise slides and lanterns are spoiled by inexperienced hands.

XV. ANIMAL NUTRITION RESEARCH

A three year animal nutrition scheme was sanctioned by the Imperial Council of Agricultural Research a few years back. Funds for the scheme were provided during the year under report. The Imperial Council of Agricultural Research will provide Rs.45,000 for the scheme and the Assam Government will provide the balance Rs.12,800. The Physiological Chemist, who will carry out the researches, is being selected by the Federal Public Service Commission and is expected to commence work next year. The work will be done at the Khanapara Cattle Breeding Farm near Gauhati. Quarters for an Assistant Chemist, two Fieldmen, and 8 labourers were built there during the year.

APPENDIX IV

DEMONSTRATION, ETC.

I—SURMA VALLEY

(S. Majid, B.SC., ASSOC.I.A.R.I., Deduty Director of Agriculture, Surma Valley)

Mr. B. B. Das was in charge of the Surma Valley from the beginning of the year till the 9th of June 1939. He went on leave from the 10th June, handing over charge to Mr. L. Barthakur, who continued as the Deputy Director of Agriculture, Surma Valley till the 7th February 1940, after which date he was appointed Special Rural Uplift Officer for the Lower Assam Valley and I took over charge from him, which I continued to hold till the end of the year under report. There were 7 Agricultural Inspectors and 27 Demonstrators under the Deputy Director of Agriculture, Surma Valley for carrying out demonstrations. There were two more Inspectors—one for the Agricultural Training Class at Sylhet and the other for conducting power pump irrigation. The Entomological Assistant, appointed temporarily in 1936-37, continued to work during the year under

review. Under the Supervision of the Deputy Director of Agriculture, Surma Valley, there were also a Jute Inspector and a Demonstrator for jute development work, which is being financed by the Indian Central Jute Committee. A temporary Mycological Assistant, appointed last year, was also engaged in investigating the problem of pan diseases up to the 16th May 1939.

2. *Weather*.—The season began quite favourably for aus, sail, amon and jute. A continuous downpour for a week during July, caused a flood which damaged the rainy season crops, such as aus and sail. Sail seedlings were particularly affected by the flood in lowlying areas but the damage was localised. The incessant downpour hampered intercultural operations of crops like sugarcane and jute. After the flood, the season again became favourable for crops like sail and amon. There was again a heavy downpour in October 1939, which damaged rabi sowings.

A spell of drought which prevailed from November to March 1940 was prejudicial to the growth and development of rabi crops. The weather for the boro crop was throughout ideal.

3. *Paddy*, The statement below shows the results of varietal demonstrations with aus, sail asra and amon paddies—

Varieties	Average increase in yields in lbs. per acre of the recommended type of paddy over the local ones								
	Number of plot	North Sylhet	South Sylhet	Habiganj	Karimganj	Sunamganj	Jaintia	Cachar	Average
Dumai 139-6	84	287	163	190	264	97	328	..	221
Murali 36-30	103	179	232	177	308	78	211	287	210
Chengri	5	160	..	163	..	..	..	..	161
Murali 36-14	7	77	..	199	..	..	..	..	138
Kai Murali	74	155	223	..	238	228	..	199	208
Aus Jaria	17	247	216	..	..	..	..	..	231
Sail Badal	9	201	220	194	200	..	..	..	204
Dhola Badal	64	250	323	162	237	263	122	311	238
Bansmati	7	..	..	..	472	..	..	183	328
Kasalat	25	..	227	..	263	..	..	..	245
Laki	10	217	367	138	..	..	..	157	220
Habiganj Amon I	45	182	185	164	131	245	236	284	204
Ditto II	100	202	193	230	229	147	323	257	226
Ditto III	33	309	206	181	222	70	321	171	211
Nagra Sail	89	227	181	238	292	226	248	223	234
Lati Sail	87	226	206	..	344	144	320	222	244
Bejoy Sail	8	188	196	..	..	..	..	..	192
Kerr Sail	113	234	219	191	292	148	206	259	221
S. C. 638-3	1	282	..	..	..	..	..	..	282
S. C. 671/16	50	..	181	189	302	..	248	..	230

Varieties	Number of plots	Average increase in yields in lbs. per acre of the recommended type of paddy over the local ones							
		North Sylhet	South Sylhet	Habiganj	Karimganj	Sunamganj	Jaintia	Cachar	Average
Ar- C. 353/148	6	..	..	157	..	186	..	..	[illegible]
Badshabhog	1	307	..	..	..	..	..	..	[illegible]
Habiganj Boro I	17	221	..	326	..	386	..	..	[illegible]
Ditto II ..	12	..	..	342	..	298	..	..	[illegible]
Ditto III	2	..	..	..	..	76	..	..	[illegible]

A few of the best yields obtained in these demonstrations, together with the yields from the check plots, are given below :—

Demonstration plot		Check plot		Average Increased yield in lbs. per acre	Remarks
Variety	Average yield in lbs. per acre	Variety	Average Yield in lbs. per acre		
Dumai 133/6 ..	4,399	Kali Dumai ..	4,110	287	Sadar Subdivision.
Chengri	1,391	Local Chengri ..	1,228	163	Habiganj.
Murali 36/30 ..	1,755	„ Murali ..	1,453	308	Karimganj.
Kaimurali ..	1,839	„ Kaimurali ..	1,601	238	Ditto.
Aus Jaria	1,678	Dudbal Aus ..	1,431	247	Sadar Subdivision.
Kachalat	2,075	Local Variety ..	1,812	263	Karimganj.
Sail Badal	1,994	„ Sail Badal ..	1,774	220	South Sylhet.
Habiganj Amon I ..	2,581	„ Amon ..	2,294	284	Cachar.
Habiganj Amon II ..	1,953	„ „ ..	1,696	257	Ditto.
Lati Sail	2,402	„ Lati ..	2,058	344	Karimganj.
Kerr Sail	2,204	„ Sail ..	1,912	292	Ditto.
Nagra Sail ..	2,108	„ „ ..	1,816	292	Ditto.
Dhepi Sail ..	2,476	„ Motonga ..	2,076	400	Sadar Subdivision
S. C. 671-16 ..	2,215	„ Sail ..	1,913	302	Karimganj.
Boro I	2,924	„ Boro ..	2,538	386	Sunamganj.

To meet the great demand for pure seed paddy, all the available supply from the experimental Stations at Karimganj and Habiganj were utilized for demonstration and sale.

4. *Sugarcane.*—Dacca Gendari, a newly introduced chewing variety, is steadily gaining popularity. Improved types, *viz.*, Co. 213, 290, 313, 419, 408, 421 and 361 and Poj. 2878 and 2714, obtained from the Jorhat Farm, were issued or the demonstration and are steadily establishing their superiority over the local *Khagri* canes. Of these Co. 213 covers not less than 90 per cent. of the area under improved canes. This variety yielded an average increased outturn of 316 lbs. per acre or 18·9 per cent. over the local variety in demonstrations.

During the year 1,84,800 sugarcane setts of improved types were distributed on the Return System. The gradual increase of the area under recommended types of canes in this valley is mainly due to the demonstrations and propaganda that are being carried on by the Department year after year. Still not more than 10 per cent. of the total area under sugarcane in this valley has been brought under improved strains. More strenuous attempts are, therefore, being made to make up the lee-way.

5. *Jute.*—The Jute Development Staff, maintained by the Indian Central Jute Committee continue their efforts for increasing the area under the recommended variety of jute D.154, as well as for bringiug about improvements in the methods of cultivation, retting, extraction, etc. Owing to the scarcity of pure seeds, only 258 lbs. of D. 154 jute seeds, obtained from Dacca, were distributed during the year.

6. *Potato.*—In order to demonstrate the value of improved potato seeds as many as 46 comparative trials were carried out all over the valley. In some centres of the Sylhet District the improved varieties have done extremely well, so much so that the demand for improved seeds was very great and could hardly be met. In the North Sylhet Subdivision the Shillong improved seeds gave an increased yield of 635 lbs. per acre over the local seeds, and the Shiilong grown Darjeellng potato gave an increased yield of 871 lbs. per acre over local seeds. The average increased yield from the improved varieties varied from 635 lbs. to 1448 lbs. per acre. At Habiganj, Darjeeling potato gave an increased yield of 1044 lbs. per acre over the *deshi* variety.

To study the effect of different manures on potato, some manurial trials were carried out in this valley. Preserved cowdung gave an average increase of 1026 lbs. per acre ever unpreserved cowdung. In order to demonlstrate the utility of the water hyacinth compost, heaps were made in some ocalities of the Sylhet Sadar Circle. The application of 50 maunds of rotten water hyacinth together with 100 mds. of cowdung per acre gave an increased yield of 525 lbs. of potato per acre. Oilcake at the rate of 10 maunds per acre combined with 100 maunds of cowdung per acre gave an increased yield of 1422 lbs. of potato per acre over cowdung alone at 100 maunds per acre. Application of oilcake at the rate of 3 maunds per acre and of sodium nitrate at 4 mds. per acre gave an increased yield of 2664 lbs. and 1675 lbs. per acre respectively over no manure. At South Sylhet irrigated plots gave an increase of 357 lbs. per acre over unirrigated ones.

7. *Rabi Crops.*—The weather for rabi crops was very uncertain. The results of rabi crop demonstrations are given below :—

Results of Demonstrations with rabi crops

Crops	Number of plots	Average outturns in lbs. per acre.							
		North Sylhet	South Sylhet	Habiganj	Karimganj	Sunamganj	Jaintia	Cachar	Average
Kalai	70	798	528	879	884	660	882	416	721
Sonamug	66	920	561	729	865	670	510	444	671
Peas	80	951	563	643	788	869	683	680	739
Gram	49	1,083	660	793	..	794	533	510	729
Masuri	50	..	502	516	756	611	486	423	549
Khesari	49	..	528	560	..	743	557	503	578
Linseed	42	795	516	..	759	..	584	477	626
Pusa Linseed	5	..	..	..	..	620	..	..	620
Tobacco (Bhengi)	22	1,177	..	1,291	1,441	1367	..	1,306	1,316
„ Motihari	31	1,225	..	912	..	2,067	873	1,084	1,230
„ Pusa (T.28) ..	9	..	..	1,012	..	1,616	..	..	1,314
Chillies Pusa (T.34)	1	..	..	..	1,286	..	..	..	1,286
Wheat Pusa	7	..	727	..	..	..	..	..	727
Groundnut	5	1,284	..	..	760	..	..	..	1,022

A good number of introductory trials were conducted with improved Motihari and Bhengi tobacco seeds. The results obtained are given in the above table which show the suitability and success of rabi crops in different localities.

8. *Cultivation of English vegetables.*—The cultivation of English and country vegetables is now gradually becoming popular. The efforts of the Department in encouraging vegetable growing on commercial lines have been crowned with success. A large number of middle class gentlemen have taken to market gardening in the suburbs of several towns for earning their livelihood. Instances are many in the Sadar Subdivision which prove the economic value of vegetable growing. Many farmers are earning Rs.700, to Rs.800 a season by growing English vegetables on about 3-6 *bighas* of land by following judicious rotation. The demonstration staff of the Department is already in touch with no less than 152 such vegetable growers in the different Subdivisions. As there is a growing demand for seedlings of English vegetables, a small plot has been laid in the compounds of the Deputy Director's office for raising seedlings. There are mainly sold to towns' people and others who are unable to raise their own seedlings. This has proved a success.

9. *Manures.*—Demonstrations on the use of preserved cowdung have given very good results and vegetable growers have been successfully using preserved cowdung for raising English and country vegetables. There has been an increasing demand for pitted manure. The utilization of water hyacinth compost for vegetable growing, recently demonstrated, has also proved to be a practical proposition. During the year under report, 176 covered manure pits were made through the efforts of the demonstration staff. The demonstration of water hyacinth compost-making was conducted in 20 places in the Sadar Subdivision.

Chemical manures, mainly sodium nitrate, sulphate of ammonia and superphosphate, were in great demand for growing vegetables and manures, worth Rs.457-6-6, were sold through the Seed Depot against Rs.269-10-0 worth of manures sold in the previous year. In addition to what is sold through the Seed Depot, a large quality of chemical fertilizers annually sold by private dealers at Sylhet, Kamalganj and Sremangal. Bonemeal is sold in large quantities in Jaintiapur.

10. *Introduction of improved implements.*—We have been making strenuous efforts for popularising improved implements. No appreciable progress has however been made owing to the unsuitability of some of them to local conditions. During the year under report, Rs.130-14-0 worth of implements were sold. The extensive use of some of these improved implement depends, to a great extent, on the strength of the draught animals. The poor condition of our draught animals is a handicap in this direction.

11. *Agricultural exhibition and propaganda.*—During the year, the Department participated in 4 agricultural shows at Tajpur, Beanibazar, Mutukpur and Salchapra. The exhibition at Tajpur was a great success. About 15 to 20 thousand people daily visited the place. This was the first of its kind in this locality. Lantern lectures were also delivered by the demonstration staff on the different phases of agricultural improvement. Many of our useful activities do not get due recognition in the absence of necessary propaganda. It is essential that greater importance should be attached to agricultural propaganda as that is undoubtedly one of the best means of putting across the results of experimental work to cultivators.

12. *Demonstration Farm.*—The Malugram Demonstration plot at Silchar continued to successfully demonstrate the growing of vegetables. Attempts were made during the year to utilize it to as great an extent as possible for raising vegetables and other seeds. Some seeds were collected during the year under report.

The Rural Reconstruction campaign started in February, 1940, provides for a nursery and demonstration plot in each of the 15 centres of this valley. These will undoubtedly provide the nuclei for intensive demonstration for the extension of fruit growing and the raising of commercial crops.

13. *School gardening.*—Gardening in Muktabs, Lower Primary, Middle Vernacular, Middle English and High English Schools continued as usual. Award of prizes has to a certain extent increased the enthusiasm of the young pupils but paucity of funds for proper manuring, fencing and sundry item of expenditures, together with dearth of suitable land for successful gardening, have stood in the way of further progess. During the year under report, gardening was in progress in 188 schools of this valley.

14. *Advice and help to middle class farmers.*—The number of gentlemen farmers is gradually increasing. Our demonstration staff visited their farms from time to time and gave them necessary advice which is being increasingly appreciated. The great difference between shallow and deep ploughing and many improved cultural practices were explained to them. There were altogether 78 farmers of this type in this valley. Vegetable gardening and fruit farming are receiving greater attention from them.

15. *Agricultural training class.*—The Agricultural training classes were originally started to divert unemployed youths to agricultural pursuits. The Training Class at Sylhet is situated near the Government Cattle Breeding Farm and covers an area of a little more then 8 acres. During the year under review, the fourth batch of unemployed youngmen were continuing their training in both practical and theoretical agriculture.

16. *Improvement of land by bunds and canals.*—As in the previous year, the Fenchuganj Krishak Samity directed their efforts for improving land by means of bunds and canals. A bund was put up in the perennial rivulet Paglacherra, near Kayasthagram, and sufficient water was compounded to bring 150 acres of land under winter crops.

17. *Agricultural Associations.*—Some associations were organised in the Sadar Subdivision. The idea was to organise these associations, with a small seed farm attached to each. These farms will form the nuclei of the activities of the Department in their respective localities. If these associations are established and successfully run, the necessity of knocking at every door for conducting demonstrations will be avoided. Most of these associations, however, suffer from financial disabilities and it will be well to render them small financial help. The number of Agricultural associations organised in the Sadar Subdivision is 11. Of these, the best is the Satis Agricultural Association near Fenchuganj. In Habiganj Subdivision there are three agricultural associations which have been in existence for a little over a year and are doing good work. Some associations have been organised in Cachar district also.

18. *Water Hyacinth.*—During the year under report, steps were taken to save paddy crops from the onslaught of water hyacinth. The cultivators of Kukurail, near Fenchuganj and Balaganj, put in bamboo *arhs* to keep the pest from invading paddy fields. The combined effort was a great success. Similar successful efforts were made at Fulshind and Negal. In the South Sylhet Subdivision the Agricultural Department co-operated with the executive authorities in conducting water hyacinth campaigns and observing water hyacinth weeks.

19. *Entomological Work.*—The main work of the Entomological Assistant was to study the behaviour of rice swarming caterpillars, which cause serious damage to paddy particularly in the Jaintia Parganas, and devise control measures. Four centres at Karaballa, Kanaighat, Gasbari and Jaintiapur were selected for carrying out systematic campaign and propaganda. Besides starting a campaign against rice swarming caterpillars, measures were devised to control rice bugs in the *aus* crop, rice case worms in rice seedlings and rice stem-borers in the maturing rice crop. In all the centres these insects were watched and such control measures as (*i*) bagging, (*ii*) light traps on dark nights, (*iii*) netting by *falain jal* (a net used for catching fish were adopted). Forty-seven reports of insect attack were also dealt with.

20. *Bee-keeping.*—The apiary at Jaintiapur was put on a stable footing during the year on a plot of Government land behind the Jaintiapur Thana compound, which is also being developed as a Rural Reconstruction Nursery. The work commenced systematically from November last with two colonies only. The number of colonies were gradually increased to 12. Three colonies were given to Sripur Garden and one to the Training Class at Sylhet. Honey extraction was made only once during the season from 3 colonies specially set apart for the purpose and 40 lbs. of pure honey were obtained. There was a great demand for this honey at Sylhet.

21. *Mycological Work.*—In the Jaintia Parganas the paddy crop in Pyaingul and Dhargram (in Gowainghat Circle) was severely affected by Sclerotium Oryzæ and Helminthosporium Oryzæ. Necessary advice was given to the cultivators for control of the fungi. Further work is to be continued to prevent the crops from damage.

A temporary Demonstrator was engaged for the control of Pan diseases. In addition to the normal spraying operation conducted by him, a survey of the *pan* area in the South Sylhet Subdivision was carried out under the supervision of the agricultural Inspector, South Sylhet.

22. *Continuous Cropping Programme.*—That continuous cropping with judicious rotation does not deplete the land was demonstrated at Sadarkhola, Bagbari, Akhalia, Rainagar, and Dakshingach of the Sadar Subdivision with great success. Rotation began from the *rabi* season. During the *rabi* season, English vegetable and potatoes were grown on lands meant for the purpose and these were heavily manured with cowdung at the rate of 200 mds. per acre in combination with oilcake at the rate of 10-15 mds. per acre and for top dressing sodium nitrate or ammonium sulphate was used. During the rains early broadcast *aus* paddy, followed by transplanted *aus*, was put on the same piece of land and the residual effect of the heavy manuring was quite apparent. The cultivators reaped a harvest of about 24 maunds of *aus* per acre. The area on which such demonstrations were conducted was about an acre of land. These demonstrations proved the advantage of continuous cropping, with judicious rotation. The cultivators got a bumper crop due to such heavy manuring. Their gross income was between Rs. 700 to Rs. 900 a year. After deducting an expenditure of Rs. 200 to Rs. 300 the net profit was between Rs. 400 to Rs. 500.

23. *Rural Reconstruction.*—The Rural Reconstruction Campaign was inaugurated in the Surma Valley with the opening of the Rural Reconstruction Centres at Pagla, Jagannathpur and Kulaura towards the end of January, 1940, by the Hon'ble Maulavi Munawwar Ali, Minister for Agriculture. The Rural Reconstruction Organisers, appointed by the middle of February 1940, joined the various centres after undergoing a short course of training at Sylhet. Fifteen centres have been organised in the Surma Valley—one each at Tajpur, Pagla, Jagannathpur, Jamalganj, Kulaura, Kamalganj, Jaintiapur, Bhadeswar, Beanibazar, Gangajal, Nabiganj, Shaistaganj, Narsingpur, Buribail and Chandrapur (including 2 centres formally opened in April 1940) which cover more than 200 villages. Work in these centres really started by the middle of March 1939, after various preliminaries were gone through. A sum of Rs. 600 was budgetted for each centre. The work in these centres comprised the laying out of nurseries and demonstration plots, building and repairing of roads, clearing of tanks, jungles, etc., digging of manure pits, distribution of improved seeds, instructions on spinning and weaving,

establishment of circulating libraries and propaganda for the improvement of agriculture, cottage industries, rural sanitation, education, etc. It is indeed a credit to the demonstration staff of the Department that about 25 night schools were established in these centres within about a fortnight.

II.—UPPER ASSAM VALLEY

(F. HAQUE, DIP. IN AGRI., DEPUTY DIRECTOR OF AGRICULTURE, UPPER ASSAM VALLEY)

I was in charge of the Upper Assam Valley throughout the year under review. The demonstration staff of this valley consisted of 5 Agricultural Inspectors and 17 Agricultural Demonstrators, including one Lac Demonstrator. There were also an Agricultural Inspector in charge of the Agricultural Training Class at Jorhat and a Jute Demonstrator at Nowgong—the latter being maintained by the Indian Central Jute Committee for development work on jute.

Demonstrations during the year under report were carried out mostly through agricultural associations, which numbered 68. Many demonstrations were arranged in areas which are compatatively backward, in consultation with important cultivators and middle class farmers of those localities. Where conditions favoured, farming on a collective basis was undertaken with success.

2. *Paddy*.—Demonstrations with improved varieties of paddy were carried out extensively during the year under report.

Ahu paddy.—Amongst the recommended varieties of *ahu* paddy grown in cultivarors' fields for demonstration, Rangaduria has proved to be by far the best in point of yield and ripening, and consequently it was used on an extensive scale for demonstration. During the year Rangaduria gave an average increased yield of 104·3 lbs. per acre over local varieties. This variety, however, is only suitable for alluvial soil containing some organic matter and cannot, therefore, be grown in the riperian tracts of Nowgong, North Lakhimpur and Sibsagar. An early variety with white kernel and heavy yield which can be sown in February and harvested in May or early June before the coming of rain and flood is now in great demand.

Sali paddy.—Nine varieties of recommended *sali* paddy were demonstrated in 319 plots. Prosadbhog, an old introduction, is still maintaining its superiority over the local varieties in all areas except the Dibrugarh Subdision. Laudumra and Kanaimuluk have stood their trial well and are gaining popularity because of better yielding capacity and milling quality. Badshabhog and Dhusari appear to have done well even on Dibrugarh soil, where other varieties could not thrive. Vijoysali and Jahari appeared to be unable to withstand abnormal weather condition. There is still some demands for a strain which will cook soft as it is complained that the recommended varieties yield only hard rice. The outturn of *sali* paddy was not quite up to expectation this year due to the prevalence of insects, spells of dry weather and unequal distribution of rainfall. The table below shows

the increased yield (in lbs. per acre) obtained from the recommended varieties over the locals :—

Recommended Variety	Total number of demonstration	Dibrugarh	North Lakhimpur	Jorhat	Golaghat	Sibsagar
Prosadbhog	126	72·5	126·75	262	232	173
Laudumra ...	71	73·5	362	116·5	113	248
Kanaimuluk ...	60	...	...	176·6	232·5	171
Latamuguri ...	12	37·5	80	...	...	...
Vijoysali	11	63·5	...	...	...	...
Jahari	6	81·5	...	...	...	...
Bhogdhepa	11	50	...	...	1·54	...
Dhusari	19	103·3	...	...	205·5	...
Badshabhog	3	174·5	...	...	...	...

Asra paddy.—Demonstrations with two types of shallow water *aman* or *bao*, *i.e.*, *asra* paddy, were conducted in 11 plots in flood-affected areas of Jorhat and North Lakhimpur. Both of them did quite well. In future years, more attention will be paid to this type of paddy which has really a bright prospect. Three types of *aman* paddy, namely, Hbj.No. 1, No. 2 and No.3, were tried in 24 plots in the districts of Nowgong, Jorhat and North Lakhimpur. Hbj. No.1 and No. 2 could not do well in Jorhat, but yielded a good crop in Nowgong and North Lakhimpur, while Hbj. No.3 proved quite successful in Jorhat. Many parts of this Division are annually visited by floods and therefore, a really good flood-resistant type of *bao* paddy is urgently required. Though it is too early to say anything definite about the performance of the Hbj. varieties, still this much can be said that they are likely to answer the need of these localities.

Vigorous attempts for introducing *boro* paddy in the low-laying areas of Nowgong, Lakhimpur and Sibsagar, where no other paddy crops are grown or could be grown, were continued. Flood-affected tracts were selected for this purpose. Twenty-three maunds 32 seers of *boro* paddy seeds were issued to North Lakhimpur, 47 maunds to Jorhat and 37 maunds 17 seers to Nowgong on requisition from the cultivators. As during the previous year, the cultivators in North Lakhimpur who showed keen interest in the beginning fell back when the seeds arrived. Cultivation was done with the greatest difficulty and it was possible to gather the harvest from 6 bighas only.

The yield was about 15 maunds per bigha. Persuasion has so far failed, and it seems nothing can be done without compulsion. In Jorhat, however, the attempt was successful. About 130 bighas were sown with this crop, which grew quite luxuriantly and the people evinced great interest in the work. Unfortunately, however, the crop was rendered sterile by heavy and continuous showers of rain during the flowering season and only about 20 per cent. of the crop could be saved. In Nowgong, about 600 bighas were cultivated with *boro* paddy in 4 villages. A big area in Jarabari Mauza was cropped under irrigation with power-pump and the people took great interest in raising a successful crop.

3. *Sugarcane.*—Demonstrations with 10 varieties of improved sugarcane were organised in 89 plots and the results proved quite satisfactory, as usual.

The following table shows the increased yield of *gur*, in pounds per acre, obtained from improved varieties over the local canes :—

Varieties	Number of demonstrations	Average increased outturn in lbs. per acre					
		Dibrugarh	Jorhat	North Lakhimpur	Nowgong	Golaghat	Average
Poj. 2878	12	21,00	..	1,950	300	429	1,195
Poj. 2714	13	36,20	2,265	..	660	1,402	1,987
Co. 290	7	..	4,197	..	..	770	2,483
Co. 210	4	1,100	..	..	..	489	794
Co. 361	8	2,340	1,497	..	420	401	1,164
Co. 213	6	..	1,859	340	..	..	1,094
Co. 408	12	..	..	..	467	..	467
Co. 419	13	..	..	..	410	..	410
Striped maurituous.	8	..	..	618	..	..	618 (One of the oldest recommended variety)
D. 74 ..	6	..	..	..	173	..	173

Co.361, Co.408 and Co. 419 did quite well. The performance of Poj 2878 and 2714 and Co.290 was exceptionally good. With the extension of the area under superior canes, necessity has arisen for devoting greater attention on better types of furnace, improved methods of manufacturing *gur*, and better storage. For this work we need a Sugar Technologist, who can now be profitably engaged.

The statement below shows the results of trial with 8 varieties of superior canes, put to single trials in different localities in order to find out the trend of yield and performance in the cultivators' fields :—

Variety		Yields in lbs. per acre			
		Dibrugarh	Majuli	Barpathar	Dhakuakhana
Poj. 2714	...	7,960	6,791	...	5,342
Poj. 2878	...	...	...	5,740	...
Co. 408	...	...	5,125	...	...
Co. 419	...	...	7,350	...	...
Co. 290	...	...	6,968	...	...
Co. 213	...	6,115	...	...	...
Co. 210	...	5,600	...	...	...
Co. 361	...	6,200	...	...	...

Furnaces of the Mc-Glashan type, constructed during the previous years, were duly maintained and during the present year a few more such furnaces were added to the list.

All the power-crushers, supplied during the previous years, were in working order. There were enquiries for two more crushers, but due to the uncertain condition of the market the crushers could not be supplied. One power-crusher was lent to Maulvi Sahiruddin at Barpathar for demonstration.

The sugarcane concerns, which are equipped with power-crushers namely, (*i*) the Bhagyalakhi Agricultural Farm, (*ii*) the Kuhiabari Estates, (*iii*) the Satyabati Sugarcane Farm, (*iv*) the Baideha Sugarcane Factory, (*v*) the Deopani Sugarcane Estates, (*vi*) the Madarkhat Sugar Factory, (*vii*) the Bhekulajan Sugarcane Farm, (*viii*) the Nalini Estates, (*ix*) the Kushumtali Agricultural Farm and (*x*) the Naharani Agricultural Farm, were inspected from time to time by the Demonstration Staff and were given all possible advice and help. The sugar concerns at Baideha, Modarkhat and Deopani manufactured some sugar on a small scale.

4. *Potato*.—Though the superiority of Shillong potatoes has long been established, yet 30 demonstrations were held for maintaining the continuity of the work. Darjeeling (Shillong grown) potatoes, which we have been trying in the cultivators' fields for the past few years with a certain amount of success, have proved to be of better keeping quality and more resistant to red ants. Consequently, the demand for seed of this variety is increasing yearly.

Admittedly it is high time for investigating more thoroughly the problems connected with the storage of seed potatoes. Damp climatic conditions in the plains and lack of knowledge regarding proper storage of tubers for seed purpose prevent the cultivators from preserving seeds for their own requirements and consequently they have to run to the *Mahajans* every year. It is needless to say that these *Mahajans* or potato dealers supply seeds on terms decidedly advantageous to themselves.

There is yet another experiment which should be tried by the Department at all costs: whether seeds obtained from the winter planting are preferable to those obtained from the February planting for use as planting material in the next season and whether these are suitable for the purpose of preservation.

The table below shows the average increased outturn in pounds per acre of the recommended varieties over the bazar potatoes:—

Variety tried	Total No. of demonstrations	Average increase in lbs. per acre			
		Dibrugarh	North Lakhimpur	Jorhat	Average
1. Shillong Potatoes ...	30	...	105	909	507
2. Darjeeling Potatoes ...	8	97·56	...	...	97·56

The results are not uniform as on account of dry conditions during the winter crops did not grow equally well everywhere

5. *Jute*.—In Nowgong, developement work on jute was carried on under the control of the Indian Central Jute Committee. Seeds of high yielding strains, such as, of D. 154, were distributed for multiplication.

6. *Pulses, Rabi and other Miscelianeous Crops*.—Cultivation of pulses, *rabi* and other miscellaneous crops was done on an extensive scale, mostly in Nowgong and the flood-affected areas of Majuli. Weather conditions during winter were quite unfavourable for proper growth of the crops. Results obtained were not worth recording.

About 104 maunds of wheat seed were distributed, mostly in the flood-affected areas. The people, particularly of the Majuli tract, took much interest in its cultivation. Due to unfavourable weather an average outturn of 773 lbs. only was obtained per acre. Wheat has a promising future in tracts like Majuli and the riperian areas, provided the risk of rust or smut and hail-storm at the ripening time can be avoided.

Of oil-seeds, mustard, linseed and groundnut were the three kinds that found a place in the demonstration programme. On account of unfavourable conditions during winter, mustard did not grow well. The crop was seriously attacked by aphis and consequently the yield was very poor.

Linseed, on the other hand did quite well. If the market is good, it is bound to gain in popularity because it can be grown almost on any kind of soil, requires less cultivation, is free from the attack of aphis and is not very much affected by weather conditions during the winter. In North Lakhimpur

about 6 maunds of linseed were distributed and cultivators took great interest in the crop and in spite of the indifferent weather during winter, the average yield obtained was 782 lbs. per acre. In Nowgong, there was decreased cultivation on account of bad market.

A large quantity of Pusa and Matihari tobacco seeds were distributed during the year. These types of tobacco are very much liked by the growers because of the good size and quality of the leaves. Curing leaves under local processes, however, is not satisfactory. Unless improved methods of curing is introduced, there will be practically no encouragement for tobacco cultivation. The matter is engaging the attention of the Department.

Groundnut was tried during both *kharif* and *rabi* seasons. The *rabi* season crop was not satisfactory probably on account of prolonged drought, while the *kharif* crop produced quite a fair yield. This is an important money crop and there is no gainsaying the fact that it has an immense possibility in consideration of its suitability to local climate and soil both as a *kharif* and *rabi* crop. The only risk to be guarded against is damage caused by Red-ants and field-rats.

Soyabean was tried in a few places. As in the previous year, the crop did not do well in respect of yield though it attained a good vegetative growth, but without sufficient pods.

Cultivation of English vegetables is becoming more and more popular from year to year. Its cultivation has spread to the remotest corners of the districts because of the fact that it has not only become an important item of food for the rich and poor alike, but also because it finds a ready market everywhere. The number of private dealers in vegetable seeds has increased enormously and it is believed they are doing good business. More than 10,000 packets of vegetable seeds were sold through the district staff during the year, besides 400 packets distributed in the flood-affected areas and for school gardening.

Onion bulbs and seeds of garlic, dhania, cotton, etc., were distributed and tried in many places with varying degrees of success. The vegetable gardening experiment, under the three-year plan undertaken at Teok, was carried out profitably for the second year under the supervision of the Department.

7. *Fruits*.—Extension of fruit cultivation received great attention as usual. Demand for fruit grafts, seedlings and suckers, specially of pineapple, was great. About 400 fruit plants and 27,000 pineapple suckers were supplied during the year. There was further extension of fruit farming in the Barpathar Developement Area and the zeal and earnestness shown by the middle class farmers in this respect is really laudable.

8. *Pan*.—*Pan* deserves more attention for extension and improvement. But extension is not possible on account of the prevalance of *Pan* disease. Experiments for the eradication of the disease must proceed any attempt for extension, but on account of paucity of funds it has not yet been possible to take up any experimental work.

9. *Manurial Trials*.—No regular manurial demonstration was conducted during the year. Compost manure, farm-yard manure and green manure are steadily gaining popularity. The advantage of suplhate of ammonias with farm-yard manure for *pan* and vegetables of a leafy nature is being appreciated by some farmers.

10. *Conservation of Cattle Manure.*—As usual, much stress was laid on the preservation of cattle dung, urine, goat dung and farm-yard rubbishes in pits under shade. The progressive and educated farmers have been pursuaded to preserve refuse matters and to use them as manure. During the year under report, 313 manure pits were dug.

11. *Sale and Introduction of Improved Implements.*—The demonstration staff spared no pains to popularise improved implements through demonstrations on the cultivator's fields and by exhibiting them in the various shows. As usual, the move was not successful due to the poverty of the cultivators. In spite of the uncertainty of the *gur* market and the sudden rise in the price of iron materials, sale of sugarcane mills and pans recommended by the Department was not bad. Thirty-five sugarcane mills and 26 pans were sold during the year.

A small power-crusher was installed at Naharani in Barpathar and demonstrations of crushing sugarcane were held for the benefit of the middle class farmers who have settled there. The demand for the purchase of one such crusher could not be met on account of the supplying firm being declared an enemy firm just in the nick of time.

12. *Lac.*—A Lac Demonstrator was appointed in May, 1939, for carrying on development work on lac. The Demonstrator underwent a course of training at Namkum before his appointment. During the year under review he visited 57 villages in the Mikir Hills and plains and conducted demonstration, etc., for improvement of lac-growing and for the expansion of this industry.

13. *Agricultural Exhibitions, Shows and Propaganda.*—The importance of exhibitions and shows have been realized by the public, which is evident from the fact that now-a-days hardly a conference or a public function goes without some sort of an exhibition as a side show. During the year under report the demonstrations staff participated in a good number of conferences, exhibitions, etc., of which mention may be made of the following :—(*i*) Lachit Mela held at Jhanji in February 1940, (*ii*) Kaliani Exhibition held in March 1940, (*iii*) Holongapar Agricultural Meeting, (*iv*) Majuli Krishak Sanmilon, (*v*) All-Assam Students' Conference at North Lakhimpur, (*vi*) Rural Uplift meeting at Narayanpur held under the Presidency of the Deputy Commissioner, Lakhimpur, (*vii*) Garamur Rural Reconstruction Conference, (*viii*) Rural Uplift meeting at Rahmoria, (*ix*) Rural Uplift meeting at Samaguri, (*x*) Rural Uplift meeting at Rupahi, (*xi*) Rural Uplift meeting at Chauldhoa, (*xii*) Public gathering at Senchowapukhuri (Dibrugarh), (*xiii*) Public gathering at Haldhabari (Dibrugarh), and (*xiv*) Public gathering at Tipling Bamungaon (Dibrugarh).

In addition to the public gatherings mentioned above, the demonstration staff were required to attend a number of small gatherings held in their jurisdictions, particularly in connection with the affiliated village agricultural associations and the rice-hispa campaign.

In fact all our agricultural operations have a propaganda value. Dissemination of knowledge regarding improved methods of agriculture and distribution of seeds of promising strains, handy implements, plants and grafts are always preceded by an intensive propaganda. During the year under report all these activities were conducted with unabated zeal. The Honorary Organizers and other influential persons also helped us in this work. Propaganda for the adoption of collective farming met with partial success under different circumstances. Organization of village agricultural

associations received the most serious attention of the demonstration staff, during the year under report. Our experience in this line shows that developement of agriculture, for which we are devoting so much energy, can best be achieved through these associations. Our demonstration staff also established a few night schools for both adult and young men in Nowgong and North Lakhimpur.

14. *Campaign against Crop-pests.*—Reports of damage by crop-pests were received almost from everywhere. Swarming catterpillars, cut-worms, mustard aphis, etc., were a great menace to the crops as usual. Campaigns were launched against them which registered some improvement. In the Sibsagar subdivision, a huge campaign against rice-hispa was carried out in a systematic manner under the supervision of the Entomological Assistant, assisted by the demonstration staff as well as by the cultivators concerned. Systematic survey of breeding grounds was made and control measures adopted. The campaign was quite successful and evoked all-round interest and hope amongst the cultivators. Both the Deputy Commissioner of Sibsagar and the Subdivisional Officer evinced great interest in the matter.

Campaign against water-hyacinth was conducted during the year under report, but the campaign at Nowgong was not kept up.

15. *Advice and Help to the Public.*—The growing demand for help and advice was much more during the year under report than could be managed by the present demonstration staff. A good many queries on agricultural matters, such as the manner of sowing improved seeds, laying out farms, growing crops suitable for particular tracts, cropping programme for private farms, manuring, crop rotation, etc., were attended to regularly. All this has led to an increase in the office work, as well.

16. *Bee-keeping.*—The importance of bee-keeping as a subsidiary cottage industry has to a certain extent been realized by the educated people. The demand for bee-boxes and instructions on the subject was too many to comply with, and formed an important item of our work. Forty-eight bee-boxes and a number of colonies were supplied during the year under report and they were regularly supervised by the demonstration staff. Further, several persons were induced to prepare their own boxes after the designs made by the Department. A good number of persons attended the Agricultural Laboratory at Jorhat for instruction on the matter.

17. *Private Nursery, etc.*—A good number of middle class farmers have of late taken up the production of seeds, plants, grafts, seedlings, suckers, etc., on a commercial basis· These farmers are entirely dependant on the income derived from their business and they have made arrangements, with the help of the Department, to supply vegetable seeds, plants, etc., to other growers. It has become an important work of our staff to bring them to the public notice. Such nurseries are really a pride to the Department. It is evident from the gradual progress of these nurseries that there is still some scope for further expansion of this enterprise, which can be taken up by a good number of educated youths.

18. *Private Farms and Homestead Gardens.*—The demonstration staff devoted their time and labour in inducing and encouraging educated unemployed youths to take to farming and in helping and supervising their work, as a result of which considerable success was achieved in this direction. Nearly 200 private farms were helped by the Department. These farms mostly grow improved strains of crops recommended by the Department. Seeds were supplied partly free and partly on the Return System to

these farms with a view to encourage them. They are becoming an excellent medium for establishing contact between the Department and the cultivators. Many of these private farms may be regarded as subsidised farms. We are drawing on the produces of these farms for meeting the pressing demands from the cultivators in general for sugarcane setts, *ahu*, *sali* and other recommended strains of seeds.

19. *School Gardens and Jail Gardens.*—In respect of school gardening, matters have been improved the least since last year, although much attention was paid to this work. Unless the Education Department takes the initiative, it will not be possible to improve matters.

The demonstration staff continued to visit the jail gardens and gave advice and instructions necessary for their improvement.

20. *Flood-relief Operations.*—During the year under report, only the Nowgong district was visited by flood. The first flood came in during the 1st week of July. This flood extended over an area of some ten mauzas and damaged jute, sugarcane, *ahu*, *aman* and *sali* paddy seedlings to a considerable extent. The second flood, which visited the mauzas during early October, was a terrible hit to all the standing crops, which were swept away, practically leaving nothing to the cultivators. The demonstration staff, as usual, rendered prompt help to the flood-striken people and conducted relief operations in collaboration with the Revenue staff under the guidance of the Deputy Commissioner, Nowgong. The following seeds, supplied from the Deputy Commissioner's Relief Fund, were distributed to the people through our demonstration staff:—

1. Rice—257 maunds (for consumption).
2. *Sali*-paddy—1,567 maunds.
3. *Aman* ,, —396 ,,
4. Wheat,, 78 maunds 25 seers.
5. Linseed—10 maunds.

21. *Rural reconstruction.*—The Rural Reconstruction Campaign in the Upper Assam Valley was practically started from the 2nd week of March 1940, in the following centres :—

1. Rahmoria	...	(Dibrugarh subdivision).
2. Rupahi	...	(Nowgong district).
3. Barpuja	...	(Nowgong district).
4. Bhataigaon-pathori...		(Nowgong district).
5. Naharani	...	(Golaghat subdivision).
6. Majuli	...	(Jorhat subdivision).
7. Samaguri	...	(Sibsagar subdivision).

A sum of Rs. 600 was sanctioned for each centre with which the following items of work were done.

Education.—Six night schools, 2 Primary schools, 1 Weaving school and 1 library were established.

Communication.—Village roads, covering a distance of approximately 25 miles, were repaired and many branch roads were filled up by earthing. Two bamboo bridges, with wooden posts (each about 100' long), were constructed and thus many villages were linked up with main roads.

Agriculture.—The following seeds, plants, setts, etc., were distributed free of charge in the different centres according to their needs :—*ahu* paddy 52 maunds ; *aman* paddy 113 maunds ; jute 1 maund 30 seers ; *arhar* 1 maund 1 seer ; cotton seeds 5 seers ; groundnut 20 seers ; sugarcane setts 75,000 ; vegetable seeds 3(6 packets ; pineapple suckers 3,500 ; banana suckers 800 ; pear grafts and cuttings 200 ; red *Basak* cutting 1000 ; Titaful cutting 10,000. Over and above these, grafts and plants worth Rs. 57-12-0 and 6 bee-boxes were distributed free. Breeding bulls, breeding goats and breeding poultry birds were also issued free.

One seed godown for storing seeds of improved varieties was constructed and a site for starting a seed farm was selected in one centre. The construction of a village paddock was taken up in one centre.

Sericulture.—In the Majuli centre, one weaving school, one boarding house for the weaving staff and one Sericultural Demonstration house were constructed and a large number of mulberry cuttings were issued free.

Co-operation.—One co-operative store was opened.

Public Health and Sanitation.—About 17 old tanks were renovated and 3 new tanks were dug. The compounds of homesteads in almost all these centres were cleared and windows were made in dwelling houses for ventilation.

Medical and Veterinary.—A stock of medicines, worth about Rs. 104 was supplied to each centre for the treatment of sick people and for veterinary aid.

Social.—Three Common Halls and 2 *Namghars* for holding meetings, etc., were constructed during the year under report. Furniture, worth about Rs. 64, were supplied for the schools and the Common Halls.

III.—LOWER ASSAM VALLEY

(L. Barthakur, Special Rural Uplift Officer, Lower Assam Valley)

Babu K. K. De was in charge of the Lower Assam Valley from the beginning of the year u der report up to the 16th October 1939, on which date he was relieved by Mr. B. B. Das. Mr. Das went on leave preparatory to retirement with effect from the 8th January 1940, and Babu P. B. Ghose, Agricultural Inspector, Gauhati, remained in charge, in addition to his own duties. Babu P. B. Ghose was relieved by Babu K. K. De in the same capacity on the 18th February and this arrangement continued for the rest of the year. I was posted to the Lower Assam Valley as Special Rural Uplift Officer from the 12th February 1940. During the year under report there were 6 Agricultural Inspectors and 21 Demonstrators for demonstration work. Three demonstrators were also maintained by the Estates of Bijni, Mechpara and Gauripur. In addition to these, one Jute Inspector and 3 Demonstrators were maintained by the Indian Central Jute Committee for jute development work in the Lower Assam Valley.

2. *Weather Conditions.*—The season on the whole was very uncertain. It started very dry and as a result all young jute, sugarcane and paddy crops suffered considerably. Heavy showers which started in May, caused local floods in June and July. Some damage to *ahu* and *bao* paddy was done in low *char* lands. The *sali* season proved very uncertain and transplantation work had repeatedly to be given up for want of water. But a few very helpful showers, just before the flowering of paddy, improved the situation and a moderate crop was obtained. Winter months were rather dry, due to which the yield of all winter crops was much below normal.

3. *Paddy.*—During the year under report a large quantity of seeds of recommended varieties of paddy was distributed on the Return System and for demonstration Amongst *ahu* paddies, Kataktara, Rangaduria and Kaimurali gave good results. Kataktara gave an average increased outturn of 355 lbs. per acre at Tezpur over the local variety. The average increased outturn obtained per acre from Rangaduria was 166 lbs. and from Kaimurali 280 lbs, in Goalpara. Several recommended types of *aman* paddy were grown under demonstration and satisfactory results were obtained with some of them. *Aman* No.13-20 of Habiganj Farm gave an increased outturn of 405 lbs. per acre against the local standard variety at Tezpur. Extensive trials and demonstrations were conducted with Indra Sali, Latisali, Kerrsali, Bijoysali, Prosadbhog, Badsahbhog, Latamaguri, Laudumra, Bengalijoha, Laksmijoha, and Kanaimulik. In all, 219 successful demonstrations were recorded. The table below shows the average increased outturn in lbs. per acre from the recommended varieties of *ahu*, *aman* and *sali* paddy over local varieties :—

Variety	Total number of demonstrations	Gauhati	Barpeta	Dhubri	Goalpara	Tezpur	Mangaldai
Ahu							
Kataktara ..	27	..	233·5	..	132	355	250
Rangaduria ..	18	..	132·5	95·8	166	20	..
Kaimurali ..	9	..	200	128·5	280	..	..
Basmati ..	3	..	163	..	..	..	..
Fapori	2	..	..	175	..	..	..
Aman							
Aman No. 192 ..	4	..	..	80	..	240	..
Aman 38—18 ..	1	..	..	67	..	..	..
Aman 13—20 ..	12	41·8	..	70	..	405	..
Sail Badal ..	2	..	..	..	..	..	55
Dhalbadal ..	9	110	158·3	..	..	..	70

Variety	Total number of Demonstrations	Gauhati	Barpeta	Dhubri	Goalpara	Tezpur	Mangaldai
Sali							
Indrasali ..	1	..	..	240	..	..	..
Latisali	13	138·2	..	215·4	30	185	60
Kerrsali ..	6	..	550	229·5	..	..	420
Bijoysali ..	30	16	271·7	138	305	..	36·7
Prasadbhog ..	50	168·4	213·2	104	..	134	108·6
Badshabhog ..	38	..	257·2	·134	121	146	158·6
Loadumra ..	33	51·8	130·6	155·3	..	220	53
Latamaguri ..	21	130·5	322	79·3	..	30	105
Bengalijoha ..	19	535	..	317·5	330	315	165
Laksmijoha ..	2	10	..	..	..	..	..
Kanaimulik ..	6	..	..	184·5	140	..	115

4. *Sugarcane.*—The season for sugarcane was not favourable to start with, but later on it improved and a fair harvest was obtained. A large number of varietal demonstrations with sugarcane was carried out, the results of which are given below :—

Variety	Total number of demonstrations	Average increased yield of *Gur* over locals in lbs. per acre					
		Gauhati	Barpeta	Dhubri	Goalpara	Tezpur	Mangaldai
Co. 213 ..	14	160	610	850	953	1,260	320
Co. 290 ..	11	445·7	..	34·8	..	..	860
Co. 355 ..	2	200	..	..	..	..	..
Co. 356 ..	2	..	1,480	..	..	..	..
Co. 361 ..	3	..	700	..	..	..	..
Co. 419 ..	4	80	974	..	..	..	..
Poj. 2714 ..	5	..	..	..	970	620	..
Poj. 2878 ..	4	240	..	..	..	..	160
D. 54 ..	2	..	..	..	..	900	..

In all 1,79,040 setts were distributed during the year. Co. 213, a Coimbatore cane, gave the highest outturn of 6,980 lbs. of *gur* per acre, an increased outturn of 1,260 lbs. over local canes. This was closely followed by Co. 356 with an outturn of 6,480 lbs. *gur* per acre and showing an increase of 1,480 lbs.

Manurial demonstrations were conducted with (1) oilcake at the rate of 12 maunds per acre *versus* no oilcake, (2) preserved cowdung at the rate of 500 maunds per acre *versus* no manure and (3) green manuring with sunnhemp *versus* no manure. Results are tabulated below :—

Manures	Number of experiments	Increased outturn in lbs. per acre
1. Oilcake at 12 maunds per acre *versus* no oilcake.	2	700
2. Preserved cowdung at 500 maunds per acre *versus* no cowdung.	4	380
3. Green manuring with Sunnhemp *versus* no manure.	4	207

Good price of *gur* gave a real stimulous to cane cultivation and a larger acreage was brought under cane. There was great demand for setts, which could hardly be met. A power driven sugarcane crusher was worked at Garaimari again this year. More than 200 growers got their canes crushed with this crusher and prepared *gur* on the spot.

The statement below shows the amount of work done and expenses incurred in this connection :—

Name of Centre	Gross Expenditure		Cost of Diesel oil and Mobil	Total cost	Receipt	Net Expenditure
		Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
Garaimari..	Pay of Mistri	162 8 0	63 3 6	363 3 6	173 6 6 at 3 pies per tin of juice.	189 13 0
	Watchman	78 0 0				
	House rent	30 0 0				
	Miscellaneous	30 0 0				
		300 0 0				

Cultivators want to purchase the crusher on the hire purchase system but, I am afraid, it may not be possible to spare a set now. I feel also that the charges realised from the people are too small. It should be at least 6 pies per maund of cane crushed. The demonstration will be conducted at a new centre during the next year.

5. *Potato.*—There was excessive rain during the planting season and this affected early planting considerably. Normal crop was, however, obtained in most localities.

Demonstrations with (1) Improved Shillong, (2) Arranbanner, (3) Up-to-date, (4) Invernes favourite, (5) Shillong Darjeeling, (6) Darjeeling White and (7) Darjeeling Red were conducted.

The highest outturn was obtained from "Shillong-Darjeeling" with an average yield of 10,903 lbs. per acre. All the improved varieties gave greater outturn than the local potato. Manurial demonstrations with preserved cow-dung and oilcake were also conducted.

The statement below shows the results of potato varietal demonstrations:—

Variety	Demonstration Centre	Number of demonstrations	Yield in lbs. per acre		
			demonstration plot	Control plot	Average increased outturn
Improved Shillong.. ..	Gauhati ..	6	5,533	4,263	1,270
	Barpeta ..	2	5,970	3,740	2,230
	Dhubri ..	2	5,200	5,000	200
	Goalpara ..	5	4,968	4,332	636
	Tezpur ..	5	10,368	9,460	904
	Mangaldai..	1	2,480	2,380	100
Arran Banner	Barpeta ..	2	6,130	5,010	1,120
Up-to-date	Barpeta ..	2	5,880	2,920	2,960
Invernes favourite	Barpeta ..	2	5,940	3,880	2,060
Shillong Darjeeling ..	Gauhati ..	4	10,903	9,207·9	1,695·2
	Dhubri ..	5	5,766	5,704	62
	Goalpara ..	4	5,804	4,301	1,602
	Mangaldai..	2	4,860	4,460	400
Darjeeling Red	Barpeta ..	1	7,800	7,000	300
	Tezpur ..	3	9,813	8,680	1,133
	Mangaldai..	1	2,760	2,600	160
Darjeeling White	Tezpur ..	3	9,573	2,893	680
	Mangaldai..	2	3,440	3,360	80

The following table shows the results of manurial demonstrations with potato :—

Nature of demonstrations	Demonstrations Centre	Number of demons-trations	Yield in lbs. per acre		
			Demons-tration plot	Control	Average increased outturn
Preserved cowdung *vs.* ordinary cowdung.	Gauhati ..	2	12,490	9,740	2,750
	Barpeta ..	2	9,200	7,650	1,550
	Dhubri ..	2	6,440	6,020	420
	Goalpara ..	3	9,760	8,040	1,720
	Tezpur ..	3	11,093	9,320	1,773
Oilcake *vs.* no oilcake ..	Gauhati ..	2	10,387	9,980	407
	Barpeta ..	2	9,790	8,270	1,520
	Dhubri ..	2	7,546	7,020	526
	Goalpara ..	3	9,600	8,000	1,600
	Tezpur ..	2	11,740	10,700	1,040

6. *Jute.*—Jute development work was conducted by a special staff consisting of one Inspector and three demonstrators, financed by the Indian Central Jute Committee. The work consisted of—(*a*) demonstration of improved varieties, (*b*) distribution of seeds on return system, (*c*) production of seeds of improved type in cultivators' holdings and (*d*) sale of improved seeds.

During the previous year 22 maunds 8½ seers of jute seeds were distributed on the return system, out of which 19 maunds 34 seers, were realised and re-distributed. The rest could not be realised due to the damage of crop by flood in the district of Goalpara. Sixty maunds thirteen seers of seeds have been distributed during the year on the return system, including 19 maunds 34 seers mentioned above. Twenty-five seers of early variety of jute seeds were issued to cultivators for the production of seeds. The crop was successful and we purchased 7 maunds of seeds from the growers. As the area under improved jute has fairly increased jute production is no longer a necessity. The demand for seed was unusually slack and we could sell only 30 maunds, 10 seers, 8 chhatak of seeds.

The results of the demonstration is given below :—

Nature of demonstration	District	No. of plots organised	No. of plots for which results have been obtained	Average yield per acre in lbs.		Average increase or decrease per acre in lbs.
				Demonstration plots	Check plots	
1	1	3	4	5	6	7
Varietal demonstration with Early variety Jute.	Goalpara ..	16	11	1093	1057	36
	Kamrup ..	16	2	1307	1520	—213
	Darrang ..	10	6	1806	1497	309
	Nowgong ..	16	6	1537	1382	155
Varietal demonstration with D.154 Jute.	Goalpara ..	20	13	1273	1114	159
	Kamrup ..	20	11	1878	1521	357
	Darrang ..	20	16	1927	1488	439
	Nowgong ..	20	12	1838	1651	187
Varietal demonstration with C. G. Jute.	Goalpara ..	20	15	1438	1203	235
	Kamrup ..	20	7	1544	..	—23
	Darrang ..	20	7	2057	1528	539
	Nowgong ..	20	17	2038	1973	65
Green manurial demonstration with Sunnhemp on Jute crop.	Goalpara ..	..	..	..	..	..
	Kamrup ..	12	4	1673	1213	460
	Darrang ..	..	..	..	..	..
	Nowgong ..	..	..	..	..	..

7. *Rabi and other Crops*—(*a*) *Groundnut.*—Demonstrations with groundnut were carried out in several places and outturn of 2643 lbs., 1440 lbs., 720 lbs., 1305 lbs. and 1320 lbs. per acre were obtained in Gauhati, Barpeta, Dhubri, Tezpur and Mangaldoi respectively. It seems this crop is gaining in popularity, particularly among the middle class farmers.

(*b*) *Linseed.*—In all 35 demonstrations were carried out with linseed with a maximum yield of 997 lbs. of grain per acre. The average yield stood at 727lbs. only.

(*c*) *Tobacco.*—Demonstrations with improved varieties of Pusa tobacco such as, T28, T18 and T63, were carried out.

The results are tabulated below :—

Variety	Centre	Number of demonstration	In lbs. per acre		
			Outturn of demonstration plot	Outturn of control	Increased Outturn
1	2	3	4	5	6
T.28 ..	Gauhati	4	973	826	147
	Barpeta	1	693	613	80
	Dhubri	1	720	640	80
	Goalpara	4	1120	907	213
T.18 ..	Gauhati	3	892	838	54
	Barpeta	1	300	573	227
	Dhubri	4	501	432	69
	Mangaldai	2	920	680	240
T.63 ..	Barpeta	2	700	547	153
	Dhubri	1	500	500	..
	Mangaldai	1	880	720	160

(*d*) *Turmeric, Pusa Chillies and Ginger.*—These crops were grown in all the Subdivisions and successful harvests were obtained. Turmeric gave an average outturn of 14,150 lbs., 650 lbs. and 4,800 lbs. per acre in Gauhati, Dhubri and Mangaldai respectively. Ginger gave an outturn of 599 lbs. in Dhubri. Pusa chillies gave an outturn of 1,555 lbs. per acre in Dhubri.

(*e*) *Pulses.*—A considerable quantity of *khesari*, *musari*, peas, gram, *matikalai*, *sonamug* and *arhar* was distributed, during the year. The weather on the whole, was not favourable and only very moderate outturns were obtained.

The statement below shows the results of demonstrations with pulses :—

Crop	Demonstration centre	Number of Demonstration	Yield of demonstration plot	Outturn in lbs. per acre	
				Yield of check plot	Increased outturn
1	2	3	4	5	6
Khesari Patnai ..	Dhubri ..	11	1,026	956	70
	Goalpara ..	2	885	690	195
	Tezpur ..	3	910	..	..
Masuri Patnai ..	Gauhati ..	4	898	..	..
	Barpeta ..	8	784	..	..
	Dhubri ..	10	667	610	76
	Tezpur ..	1	830	..	..
Peas	Gauhati ..	5	744	..	..
	Barpeta ..	8	974	..	..
	Dhubri ..	7	717	..	..
	Goalpara ..	5	586	..	..
	Tezpur ..	9	643	..	..
	Mangaldai ..	2	495	..	..
Gram	Gauhati ..	6	835	..	..
	Barpeta ..	8	745	..	..
	Dhubri ..	11	715	..	..
	Goalpara ..	4	662	..	..
	Mangaldai ..	2	510	..	..
Matikalai ..	Barpeta ..	13	573	..	..
	Dhubri ..	34	1,154	1,035	119
	Goalpara ..	9	249	229	20
	Mangaldai ..	1	400	..	..
Sonamug ..	Barpeta ..	15	574	..	..
	Dhubri ..	41	1 203	1,076	127
	Goalpara ..	8	360	332	28
	Tezpur ..	1	450	..	..
Arhar	Gauhati ..	2	235	..	..
	Barpeta ..	4	608	..	..

(*f*) *Wheat*—A large quantity of wheat, amounting to 873-20-0 mds. was distributed in the Lower Assam Valley, mainly in the flood-affected localities. The supply of seed, however, was unfortunately very late and the crop failed in most of the localities as the drought set in a little after sowing. The following table shows some of the results of wheat demonstrations:—

Circle	Number of Demonstrations	Outturn in lbs. per acre
1	2	3
Gauhati	7	1,945
Barpeta	8	1,075
Dhubri	8	1,035
Goalpara	4	965
Tezpur	5	634
Mangaldoi	3	1,403

8. *Fruits*—Due to continued propaganda for fruit farming, the demand for grafts and plants is speedily increasing. During the year, 19,758 grafts, seedlings, etc., were distributed. The department is still dependent on outside nurseries for the supply of plants, and grafts and we keenly feel the necessity of having our own nurseries in suitable localities for bringing down the price of plants and grafts within the means of cultivators. Our Khanapara and Kokrajhar orchards helped us in the propaganda for fruit farming to a great extent.

9. *Bee-keeping*—Attempts were made to introduce bee-keeping in the rural areas. One dozen up-to-date bee boxes were distributed for the purpose but in the absence of a trained assistant the work has not advanced any further.

10. *Conservation of Cattle Manure*—As usual propaganda was conducted for the conservation of cattle manure in manure pits. As many as 204 pits were properly made during the year under report against 193 pits of the previous year.

11. *Chemical fertilisers*—Demand for chemical fertilisers was noticeable among a few advanced middle class farmers. Two thousand five hundred eighty-four lbs. of a special mixture for orange and 410 lbs. of sodium nitrate were sold at a price of Rs.204-8-0. The result proved most satisfactorily and larger quantity might be sold in the coming season.

12. *Green manuring*—Green manuring with sunnhemp was tried in different places with appreciable success. At Nalbari, in paddy, an increased outturn of 310 lbs. was obtained. At Dhubri with the same crop an increase of 103 lbs. was recorded.

13. *Improved Implements and Appliances*—During the year under report 46, three roller sugarcane mills and 34 gur boiling pans were sold. A few meston ploughs were also sold.

14. *School Gardening*—Some success was achieved in school gardening, particularly in growing winter vegetables. There were 71 school gardens during the year, to which 281 packets of vegetable seeds, 153 lbs. of seed and a number ot seedlings were supplied.

15. *Improvement of land by Bunding, Drainage, etc.*—In a few localities improvement of land was effected by means of *dongs* and bunds. Of these, the *dong* made by the people of Garal may specially be mentioned. The *dong*, which brings water from the stream Kalbhog, is about 3 miles long, 4 feet wide and 3 feet deep and waters 15,000 *bighas* of land. This locality had been suffering from scarcity of water for a period of 7 years or so— and the *dong* has removed a severe handicap to agriculture.

16. *Work in Tribal Areas.*—Agricultural operations were conducted for the improvement of tribal areas at the following places in the Goalpara District—Rangjuli, Sardarpara, Rawmari, Tilapara, Doshima, Poliarpara, Badiarpara, Dunglapara, Khara, Dudnai, Baida, Meshipara, Kotakuli, Sharapara. The headquarters of the Demonstrator of Lakhimpur were transferred to Dudnai for better management of work. In the above mentioned areas, 16,000 sugarcane setts, 74mds. of paddy, 12mds. of pulses seeds, 2,500 pineapple suckers, 119 cocoanut seedlings, 6 litchi grafts, and 4 Kagji grafts were distributed. In the Tezpur Circle, 8 mds. potato and 1 lb. cabbage seeds were distributed in the Balipara side through the Political Agent. Besides these some other seeds were distributed through our demonstration staff in other areas also.

In the Gauhati Circle, regular demonstrations were conducted at Satgaon, Noon Mati, Beltola, Lakhora and Show Kuchi for the tribal people, mostly Mikir and Kachari. At Kokrajhar, in the Dhubri Circle, a Demonstrator was posted and demonstrations conducted, along with the distribution for seeds and plants. A fruit garden was also organised for the tribal people.

Demonstrators were also conducted at Kalaigaon and Dalgaon with this object. Next year, 3 Demonstrators will be posted in the tribal areas.

17. *Campaign against Crop-Pests*—There was no serious outbreak of insect pests or diseases. Some damage to rice and pulses was recorded in Dhubri and the services of the Entomolgical Assistant were requisitioned. Light traps did very good work in controlling rice crop-pests in the Balipara Frontier Tracts.

18. *Flood.*—A minor flood in July slightly affected *ahu*, *bao* and *jute* in lowlying areas. Some demage to *sali* seedlings and transplantation work was also recorded. But there was nothing ot any serious nature and no relief operations were required.

19. *Agricultural Associations*—During the year under report, there were 60 agricultural associations in the Lower Assam Valley of which the following may be mentioned—Uttar-Kamrup Krisak Sanmilan of Nalbari, Deshi-Krishi and Silpo Unnati Sadhini Sabha of Kamarkuchi, Hakama Agricultural Association of Dhubri, Banyaguri-Multijhora Co-operative Society of Dhubri, Noduar Krisak Sanmilan of Tezpur, District Agricultural Association of Tezpur, Rangjuli Agricultural Association of Goalpara, Narikali Boro paddy growers Association of Mangaldoi, Chatla Boro paddy Association of Dhubri and Garaimari Agricultural Association of Dhubri.

20. *Exhibition and Propaganda*—During the year, we participated in the following agricultural exhibitions :—Barargaon Agricultural Exhibition in Dhubri Subdivision, Sahpur Agricultural and Industrial Shows in Nalbari, Patacharkuchi Agricultural Exhibition in Barpeta and Harisanga Agricultural and Industrial Exhibition in Mangaldoi Subdivision. Besides showing exhibits, demonstrations were held and the economic importance of various agricultural crops and operations were explained in detail. Informal meetings were also held in a large number of places. In all, six lantern lectures were delivered. In these days of talkies and cinemas, lantern has lost much of its appeal. Besides, our slides have all become out of date. Local slides would have proved more attractive and interesting.

21. *Rural Reconstruction*—The Rural Reconstruction Campaign was started in the Lower Assam Valley by the end of the year under report. The Rural Organisers were appointed in February 1940, who were posted to their respective centres after the necessary training. Twelve centres have been opened in this Valley, at Ketekibari (near Tezpur), Goreswar (near the E. B. Railway Station of the same name), Rangiya, Digheli (Nalbari), Kamarkuchi, Garal (near Jalukbari), Rampur Haoli, Kokrajhar, Ghagmari (near Fakirganj), Rangjuli and Kharmuza. Each centre consists of a group of villages, with populations of 2,500 to 3,000.

In these centres the following work was done :—

(*i*) *Industrial.*—Tools and implements, worth Rs.1,200, were purchased for demonstrations on weaving and sericulture.

(*ii*) *Veterinary*—Chemicals, drugs and disinfectants, worth Rs.285, were purchased and arrangements made to stock them in the different centres for the use of the Veterinary Assistants.

(*iii*) *Medical.*—Twenty three pounds of cinchona fabrifuge pills were purchased and distributed. A leaflet was also circulated regarding the use of the pills. These pills were of great benefit when malaria broke out with the arrival of monsoon.

(*iv*) *Agriculture.*—As agriculture must naturally play the most important part in the rural economy, agricultural improvement, have received due attention. A nursery has been organised in each centre, where grafts and seedlings will be grown for distribution. A Common Hall, with a library, seed store, quarters for the Rural Organiser and the mali, has also been arranged in every centre. It is also proposed to interest village schools by allotting plots of land for school gardening. Arrangements for Night Schools for adults are also being made. Tools and implements necessary for working the nurseries have been purchased and in most places the nurseries have been laid out. Due to shortness of time, much progress could not be achieved, but an economic survey has been started in all the centres. This should facilitate the formulation of the plan of work for Rural Reconstruction.

IV.—WORK IN THE HILLS

(I) KHASI AND JAINTIA HILLS

The demonstration staff in the Khasi and Jaintia Hills consisted of 1 Agricultural Inspector and 5 Agricultural Demonstrators, who worked under the supervision of the Deputy Director of Agriculture, Livestock, Assam. The Agricultural Inspector had his headquarters at Shillong, and the Demonstrators were posted at Shillong, Nongpoh, Jowai, Mawflong and Shampong.

2. *Paddy*—Demonstrations, showing the value of bonemeal as a manure for paddy in these hills, were carried out in 20 centres. It has been proved over many years that the introduction of bonemeal manuring in these hills has made paddy cultivation possible and profitable in many areas where the soil is too poor to carry a paddy crop without it. As a result, a large extension of paddy cultivation has taken place, especially in the Jowai Subdivision. Trials comparing the effect of bonemeal with niciphos and superphosphate were being made for many years. These trials were discontinued from last year as the results clearly showed the superiority of bonemeal over the chemical manures. Manuring at 20 centres with bonemeal at varying doses, *i.e.*, 3 maunds, 2 maunds and 1 maund per acre, gave an average yield of 1,706 lbs., 1,489·5 lbs. and 1,170 lbs. respectively, while the check plot yielded only 1,135 lbs. Our standard rate of 3 maunds per acre gave the best result. Observation of the second year's residual effect of bonemeal applied at the rate of 3 maunds per acre and of niciphos, applied at the rate of 200 lbs. per acre, showed an yield of 1,554 lbs. and 1,233 lbs. respectively, while the check plot yielded only 1,260 lbs.

In these hills, the paddy varieties of the plains do not thrive well above 3,000 feet, and we restrict our demonstrations of the Departmental recommended varieties to 2,000 feet. Trials made in former years have led us to select four varieties, which thrive best in these hills. These are—Vijoysail, Prosadbhog, Pasantabahar and Basmati. We, therefore, demonstrated these varieties in 10 centres below 2,000 feet; comparing their yields with each other and with the local paddy. Vijoysail gave an outturn of 2,027 lbs. per acre, Prosadbhog 1,852 lbs., Basantabahar 1,746 lbs. and Basmati 1,746 lbs., while the local paddy gave an outturn of 1,760 lbs per acre. Above 2,000 feet we have for many years been making trials with various types, imported from the Naga Hills. Thaveru and Ngara have done best of the varieties tried and are, therefore, being spread. A variety for high elevations, called Dzulake, is also under trial. Above 3,000 feet, the paddy is sown broadcast in these hills, whereas in the Naga Hills most of the wet rice is transplanted. In 15 centres where these trials were conducted Thaveru gave an average yield of 1,469 lbs. per acre, Ngara 1,217 lbs., Dzulake 1,314 lbs., while the local variety yielded 1,354 lbs.

In 12 trials made with upland or dry paddy, Theke gave an average yield of 1,149 lbs. per acre and Khuara 1,136 lbs., while the local type

yielded 1,072 lbs. The table below shows the yield obtained from local varieties of rice grown in the Khasi Hills:—

Place	Name of local paddy	Type of land	Period grown	Outturn per acre in lbs.
Shillong Circle—				
Umlyngka ..	Baiong ..	Dark clay soil	May to October	980
Banuin ..	Baliehiong ..	Sandy soil ..	May to November	1,080
Pynthor ..	Baiong ..	Dark Clay ..	May to October	1,040
Mylliem ..	Baliehiong ..	Sandy soil ..	May to November	1,240
Mawflong Circle—				
Langiong ..	Basawrit ..	Clay loam ..	April to November	898
Ditto	Balieh	Ditto	Ditto ditto	840
Nongspung ..	Ditto ..	Sandy loam ..	Ditto ditto	984
Ditto	Baiong ..	Ditto ..	Ditto ditto	1,060
Mawkarah ..	Bamawlai ..	Loamy soil ..	May to November	1,140
Ditto	Basynteng ..	Ditto	April to October	1,020
Nongpoh Circle—				
Nongpoh ..	Sawsynrih ..	Dark clay ..	May to November	1,968
Nongkhyllam ..	Thohmoh ..	Loamy soil ..	Ditto ditto	2,063
Marngar ..	Maikuri ..	Ditto	June to November	1,980

Twenty maunds of Naga paddy seed was purchased and sold at local prices. It was thus introduced in 27 new localities.

3. *Potato*—Distribution of potato seed, obtained from new seed issued four years ago, was made to 59 cultivators. The quantity distributed came to 18 maunds and 35 seers.

Demonstrations with improved varieties of potato were also carried out. One maund of seed was planted in each of 17 centres. In 8 of these centres records were kept of the yields of local varieties for comparison. The new varieties gave an yield of 5 maunds 12 seers for 1 maund seed against 4 maunds per maund of seed in the case of the local potato. New seeds for the winter crop were issued in 14 centres, one maund in each. Wilt disease is doing an enormous damage every year. Unfortunately, we have no remedy to offer, except preventive measures such as, change of ground and removal of sick plants. Bordeaux mixture was used against blight. The Department supplied the sprayer and chemical, while the owner supplied the labour. Thirty-seven acres were sprayed in this manner. This spraying demonstration is being conducted for about 20 years, yet the Khasi cultivators do not seem to have realised its value.

4 *Maize*—Four improved varieties of maize were distributed by the Demonstrators. In 11 plots, where outturn was recorded, the yield per acre from the new varieties was 602 lbs. compared with 621 lbs. per acre in the

case of local varieties. Mukerji gives the average outturn of maize as varying from 400 to 640 lbs. per acre, but yields up to 2,400 lbs. have sometimes been obtained.

Manurial trials on maize, comparing the effect of niciphos *plus* 100 maunds of cowdung with 300 maunds cowdung per acre, showed an increased yield of 140 lbs. for the former application. These seem to indicate that the application of nichiphos is not worth the expense.

5. *Miscellaneous Dŧmonstrations*—(*a*) Concentrated work was undertaken in three School Gardens at Bailiang and Jowai. Twenty-four packets of vegetable seeds were issued free to the schools and Rs. 10, provided by the Education Department, were spent for the same purpose.

(*b*) Planting of the soil-binding and grazing grass, named Kikuyu, which was distributed from the Upper Shillong Farm, was done by the Demonstrators in many places.

(*c*) Soybean seed was distributed in the higher altitudes, where it is not yet grown.

(*d*) Chilli seeds of improved varieties were distributed.

(*e*) Napier grass roots were distributed to people interested in fodder growing.

(*f*) Sugarcane setts were distributed. Red ants gave some troubles.

(*g*) Chestnut seeds, groundnut and turmeric were also issued.

6. *Fruits*—Two hundred and forty-one grafts of fruit trees were made by the Demonstrators in private gardens, of which 76 were peach, 108 plum, 36 pear, 12 apricot and 9 apple. Demonstration prunning of 247 mixed fruit trees and 208 orange trees was done and 168 trees were sprayed with Bordeaux mixture for prevention of blight.

7. *Supply of Seeds and Plants*—The following seeds were supplied to the plains:—potato—228 maunds, soybean large—20 lbs., soybean small—20 lbs. maize—542 lbs., tung 1 lb , Buckwheat—164 lbs., turmeric yellow—40 lbs., turmeric red—40 lbs., plantain suckers—400, pepper plants—400, pan vines —25 and orange seedlings—1,674.

One hundred and eighty-eight packets of English vegetable seeds were sold to the cultivators.

8. *Introdcution of Improved Bee-hives*—Twelve hives of the standard pattern were tried. But the bees in these hives died in the winter. Hives will have to be given a special covering during the winter.

9. *Soil Conservation and Anti-Erosion Work*—We based our work on three main points—(*a*) planting of pine seed when abandoning *jhum* land, (*b*) leaving spaced young trees when cutting jungle to make *jhum* and (*c*) leaving contour lines unhoed across the hill sides when preparing land for crops, so as to adopt a system of cultivation in strips. In many places our Demonstrators sowed pine seed themselves and the practice of leaving spaced trees is spreading. The contour strip method is more difficult to get started as the traditional practice is exactly the opposite, *i.e.*, to make the *jhum* beds running down hill.

10. *General*—In the Khasi Hills improvement of soil is more important than introduction of new crops. The natural richness of the soil has been exploited and lost. Yields are extremely low and future progress will depend more on improved methods of soil management than on introduction of improved seed. Wet rice terracing is understood and practiced, but dry crop terracing or strip cultivation, combined with tree culture, is non-existent. The Upper Shillong Farm is being laid out as a large scale demonstration of this practice.

(II) Sadiya Frontier Tract

In the Sadiya Frontier Tract there were one Agricultural Instructor and one Demonstrator. The work carried on consisted of demonstrations in villages of improved varieties of seeds, etc., wet rice cultivation and introduction of new crops.

2. *Paddy*—The area under wet rice cultivation in the Pasighat Subdivision was about 800 acres last year. During the year under report, only 770 acres were under cultivation and the outturn received was good. About 30 acres could not be transplanted for lack of rain. The area under terraced rice cultivation last year was 46 acres. During the year under report 165 acres were under cultivation in eight villages in the Pasighat Subdivision and further extension was effected in new villages by the end of the year. The outturn of the crop was good on the whole and one village got an exceptionally good crop. Most of the villages are keen on this work and are extending areas on their own without further expenses on the part of the Department. A few varieties of improved seed paddy gave good results.

3. *Sugarcane*—The total area under improved sugarcane, both plant and ratoon, was 112 acres. Growth and outturn of the crop were good, on the whole. Some damage was done in certain places by wild animals.

The above acreage includes 10½ acres under cultivation in the Pasighat Subdivision. Pressing of canes and manufacture of *gur* were being done by the end of the year. The outturn is expected to be good. All arrangements have been made for supplying *gur* to the Second Assam Rifles again.

4. *Potato*—There was no sale of seed potato through the Department during the year under report due to a rise in the price. Cultivators refused to buy seed at the rate of Rs.7 per maund. The outturn received from seed preserved from last year's crop was good.

5. *Fruits*—A few varieties of pineapple did very well in the Pasighat Subdivision and the area under these is gradually extending. The orange crop was not so abundant this year in the Balek group of villages and a few neighbouring villages. The Abors, however, did a good business in selling the fruits in Murkong Selek, Saikhowaghat and Sadiya, the fruits being sold at Pasighat, the exporting centre, at the rate of 16 for an anna. Litchi, guava, pomelo, pear and lemon, introduced amongst the hill tribes a few years ago, did fairly well.

6. *Cotton*—Garo cotton was grown on a large scale, especially by the Abors, and the outturn of the crop was good. The bolls of cotton were double the size of the local variety.

7. *Other Crops*—Jute continued to be grown by the Khamties and a few local settlers. The outturn of the crop was good and those who grew it benefited much due to a rise in price. There was a great demand for more seed for this reason.

Majulai, *matikalai* and Buckwheat continued to do well. The area under these is gradually increasing.

Some varieties of Shillong maize and millet, introduced amongst the hill tribes, continued to do very well.

Pusa tobacco grown by the Khamties and Singphos continued to do well. The leaves when harvested were double the size of the local variety.

English vegetables continued to do very well and a few varieties of country radish, cabbage, cauliflower and tomato were also grown. Most of these was sold at Saikhowaghat at a cheap rate and exported to tea gardens and other places.

8. *Improvement of Cattle*—During the year under report, a Local Fund stud bull was stationed at Pasighat and a good number of cattle were served.

(III) North Cachar Hills

During the year under report, there were one Overseer, one Demonstrator and two Terraced Rice Instructors in the North Cachar Hills. All the posts were held by local hill men.

2. *Bakitar Demonstration Farm.*—The work of this farm was, as usual conducted by the Overseer. The Upper Garden had a total of 420 fruit trees—78 of these were exotic citrus and the rest local oranges. Budding with Valencia, Washington Navel and grape fruit was done during the year and seedlings of *Jambura*, *Panijamir* and *Adajamir* were raised. Weak trees were manured with alphos. A plot of groundnut was also raised. The sale proceeds from the oranges of the Upper Garden amounted to Rs.330. Due to the failure of the citrus trees in the Lower Garden, all the surviving exotic plants were transferred to the Upper Garden. Litchi trees were bearing successfully. Plum, peach and Sapeta, introduced recently, were thriving in the Lower Garden, where 500 pineapple suckers were planted during the year under report.

3. *Demonstrations in Villages*—(*a*) *Paddy*—Murali 36/30, Agarsail and Agnisail were demonstrated at Maibong, Kalachand, Hajadisha, Boro Waphu and Diklem. A sum of Rs.800 was spent for the extension of terraced rice cultivation, during the year, during which terraced rice cultivation was introduced in the following localities:—Longren, Paija, Longkhai, Hegogulo, Dilaothai, Diklem, Longkok, Phonglo, Bhatari, Hajadisha, Jorai, Boro Laisong, Cheptuk, Michikur, Tole, Nuton Leiluk and Thapa. Due to the failure of *jhum* crops, many people applied for help and the grant for terraced rice cultivation was fully utilized. During the year, 16 maunds of seed paddy were distributed.

(*b*) *Cotton*—Comilla cotton was tried at several places. Though the plants did not suffer from wilt or insect pests, the bolls did not burst and the outturn was not good. Cotton fetched a good price this year.

(*c*) *Sugarcane*—Sugarcane was introduced in two localities—Gangdangbra and Longren—and an outturn of 2 maunds and 5 seers of *gur* was obtained from an area of 1/40th acre.

(*d*) *Potato*—Potato was introduced at Bolsol, Mukkoi, Hokai and Pangmul.

(*e*) *Fruits*—2,200 orange seedlings were distributed, during the year, at Hatikhali, Haflong, Phura, Longma and Jorai. 1,300 pineapple suckers were also distributed at various places.

(*f*) *Other crops*—Maize was demonstrated at Haflong and Maibong. A plot was sown with 10 seers of Masuri at Maibong, but the outturn was rather poor. Rupees 54 worth of English vegetable seeds were sold. The Nepalese are still the best vegetable growers in this subdivision and the local people are not in favour of growing English vegetables as they are not yet accustomed to take trouble in growing any crop for the market.

(*g*) *Improved Implements*—Only one Meston plough was issued during the year.

(*h*) *School Gardening*—In the compounds of Haflong and Maibong Primary Schools 50 pineapple suckers were planted. Banana was also grown there.

(IV) Garo Hills

During the year under report, there were two Demonstrators in the Garo Hills, who were engaged in carrying out demonstration and looking after the nursery at Tura Station and the small fruit garden at Tura Hill Top.

2. *Paddy*—Two maunds of Naga paddy seed, obtained from the Naga Hills, were distributed in 5 centres and grown in newly made terraces. This variety was not very popular due to its poor outturn. Two maunds of local *aus* paddy seed (red variety), obtained locally, were distributed in 7 centres. This variety is very popular as a catch crop and because of its good outturn. One maund 35 seers of Dumai paddy seed, obtained locally, were distributed in 6 centres. This variety is also very popular as a catch crop and because of its good outturn. One maund 10 seers of Manipuri paddy seed, obtained locally, were distributed in 5 centres. This variety, though good otherwise, is disliked by the people because of its poor yield.

3. *Potato*—Two maunds of seed potato known as Inverness Favourite, were distributed in 6 centres for growing in *jhums* as a summer crop. The crop did not thrive. The failure was attributed to rottage and an attack of red ants. Ten maunds of winter seed potato, known as Up-to-date, were obtained from the Upper Shillong Farm and distributed in 17 centres. The result was not satisfactory. The seed was received here in an unhealthy condition probably due to bad communication

4. *Sugarcane*—1,400 sugarcane setts—1,000 setts obtained from Tezpur and 400 from the Tura Nursery—were distributed in 19 centres. The crop was reported to be thriving well, both in hills and plains, on the whole. In some cases there was some damage due to an attack of red and white ants. About 190 setts will be available for distribution in May, 1940.

5. *Cotton*—Two maunds of local Garo cotton were distributed in 10 centres in the Hill Mauza No.1, where cotton was not grown formerly. Arrangement was made to sell about 50 maunds of cotton seed in those localities and it is hoped that the people will take interest from the result of this experiment and grow the crop in future. Three maunds 8 seers and 8 chataks Garo cotton seed was supplied from this district.

6. *Fruits*—(*a*) *Pineapples*—Two thousand pineapple suckers, obtained from Tezpur, were distributed in 22 centres and some were planted in the gardens attached to various Lower Primary Schools. The plants were grown with and without manure and were reported to be doing well in all centres. About 200 suckers from the Tura Nursery will be available for distribution next May.

(*b*) *Papaya*—One hundred and five seedlings, raised in the Tura Nursery, from the seeds obtained from Calcutta, were distributed in 11 centres. The seedlings were reported to be thriving well in all centres. About 150 seedlings will be available for distribution in June, 1940.

(*c*) *Jambura*—One hundred and fifty Jambura seedlings, raised in the Tura Nursery, were distributed in 11 centres. The seedlings were reported to be doing well in all the centres. An attempt will be made to bud orange on Jambura in due course. About 180 seedlings will be available for distribution next June.

(*d*) *Litchi*—Twenty litchi grafts from the Tura Nursery were distributed in 6 centres. The grafts were doing well in all centres. About 15 grafts will be available for distribution next June.

(*e*) *Pear*—Fifteen pear grafts from the Tura Nursery were distributed in 4 centres. The grafts were doing well in all centres. About 12 grafts will be available for distribution next June.

(*f*) *Apricot*—Five apricot grafts from the Tura Nursery were distributed in 3 centres. The grafts were doing well in all centres. About 6 grafts will be available for distribution next June.

(*g*) *Kagzi*—Eight Kagzi grafts from the Tura Nursery were distributed in 4 centres. The grafts were doing well in all centres. About 10 grafts will be available for distribution next June.

(*h*) *Plum*—Eighteen plum cuttings from the Tura Nursery were distributed in 5 centres. They were reported to be doing well in all centres. About 10 cuttings will be available for distribution next June.

(*i*) *Orange*—Three hundred and fifty orange seedlings, raised in the Tura Nursery, were distributed in 8 centres. The seedlings were reported to be doing well in all centres. About 210 seedlings will be available for distribution in June, 1940. Yellowing disease is very common and destructive here. Some trees died at the time of bearing fruits and some after bearing. This was perhaps due to lack of adequate water supply. People were advised to pay more attention to watering the trees in dry season.

7. *Other Crops*—(*a*) *Maize*—Three seers of maize seed, known as Golden Bantam, were distributed in 7 centres. This variety is very popular for the simple reason that it can be grown twice in a year. Two seers of seed will be available for distribution this year. 9½ seers of maize was supplied from the district.

(*b*) *English Vegetables*—As in previous years English vegetables seeds such as cabbage, cauliflower, knol khol, turnip, beans, carrot, radish, beet, peas and tomato were obtained from the Gauhati Seed Depôt and distributed in 86 centres. The result was good in some centres. Growing of English vegetables is very popular for they command a ready market and good price always.

(*c*) *Arhar*—Twenty maunds of arhar seed, obtained from Jorhat last February, were distributed in 56 centres through the Laskars with instruction to grow in those *jhums* which were being left fallow for four years according to the custom in these hills.

8. *Areca nut*—Three hundred and eighty areca nut seedlings, raised in the Tura Nursery, were distributed in 7 centres. The seedlings were reported to be doing well in all centres. About 230 seedlings will be available for distribution in June, 1940.

9. *Bee-keeping*—During the year under report, one improved bee box was received from Jorhat. The box was kept in a central place for demonstration purpose. It was reported that two similar boxes had already been made for bee-keeping by some interested persons at their own cost. The result will be known next year.

10. *Insect Pests*—The instructions received from the Economic Botanist, Assam, regarding the control of insect pests which damage orange trees were circulated widely.

11. *General*—Last year, under the instructions of the Angami Demonstrator from Haflong, about 5 acres were put under terraced rice cultivation in six different centres. During the year under report, about 2 acres more were opened, under the instructions of the Senior Agricultural Demonstrator, Garo Hills.

The experiment on wet rice (terraced) cultivation in the abandoned old nursery garden at Tura with 2 maunds of Naga paddy seed was carried out with and without manure during the year under report. The experiment will be continued.

It is noticeable that people are taking more and more interest in orange, pineapple, potato and sugarcane cultivation as these crops command a ready market at all times.

A combined Agricultural, Craft and Veterinary Exhibition was held at Tura during the year under report.

(V) Naga Hills

The agricultural staff in the Naga Hills consisted of 3 temporary Demonstrators.

2. *Paddy*—A sum of Rs.2,000 was spent in the Sadr for opening a new terraces in Sema, Sangtam and Kacha Naga areas, and Rs.1,000 was spent by the Subdivisional Officer, Mokokchung. The opening of new terraced fields by all tribes in Mokokchung, especially by the Lothas, was encouraging. More funds are needed to induce people to take to wet cultivation. An experiment with Manipuri paddy was made in Mokokchung and the yield was good. Hailstorm damage the rice crop in many eastern Angami villages. In Mokokchung the outturn of *jhum* rice was on the whole very good. Owing to late rainfall, the rice crop and millet and Job's tear were bad in the Sadr Subdivision.

3. *Lac*—There was practically no cultivation during the year as the price of stick lac had been very low for the last few years. The old stocks were sold and fetched a better price during the year and it is hoped that the Lhotas would make extensive cultivation this year. Nothing was spent in demonstration.

4. *Fruits*—The orange crop in Lhota villages was very good and oranges were sold at a good price. The orange seedlings planted in other parts of both Kohima and Mokokchung Subdivisions in the previous years were doing very well and some began to bear fruits. Giant Kew pineapple suckers, worth Rs.150, were obtained from the Akbarpur Pinery of

Sylhet, and a considerable number of plums, litchi and walnut grafts, to the value of Rs.467, were purchased from various nurseries and distributed amongst the Ao, Lhota, Sema, Angami and Kukis. The temporary Demonstrators made extensive tours and taught school boys how to graft wild fruit seedlings planted in the village school gardens. A proposal to entertain a permanent Demonstrator for fruit cultivation for the district is now under the consideration of the Government.

5. *Potato Cultivation*—Sixty-three maunds of Shillong potato seeds were distributed in Sema villages in Mokokchung Subdivision. The result was good in some places. In the Sadr Subdivision, the result of the seeds distributed last year in the eastern Angami and Kacha Naga country was very good. Shillong potatoes are not preferred by the Angamis as they cannot preserve seeds. So nothing was spent for the distribution of potato seeds in Kohima. A Demonstrator for potato cultivation is now under training at the Upper Shillong Farm. Potato cultivation by the Cart Road side villages between Kohima and Mao increased considerably and about 40,000 maunds of potato were exported last year. The price obtained was comparatively good, ranging from Re.1-8-0 to Rs.2 per maund.

6. *Other Crops*—(*a*) *Cotton*—The cotton crop was bad, but the price rose from Rs.3-2-0 to Rs.4 per maund in the Mokokchung Subdivision and it was sold in the Kohima market at Rs.5 to Rs.6-8-0 per maund. Owing to the increase in price, the Lhotas have extended their cultivation this year and it is hoped, if weather permits, more cotton will be exported next winter.

(*b*) *Chillies*—The outturn of chillies was normal and the price was about six annas a seer.

(*c*) *Pan*—Only certain Ao and Konyak villages grow this creeper. The crop was good, but the price was bad—ranging from nine pies to three annas and three pies per bunch of 100 leaves. For Manipur markets purchases were made at Nakachari at low prices but no better arrangement could be possible. About Rs.3,000 worth of *pan* was sold during the year.

(*d*) *Oil-seeds*—Sesamum crop was bad during the year, but the price per maund was Rs.4 against Rs.3-12-0 of last year. The Lhotas obtained a good crop of mustard seed last year and the Kohima Jail is getting the local product this year.

(*e*) *English Vegetables*—Vegetable seeds, worth Rs.81, were distributed in both Kohima and Mokokchung Subdivisions and the result was encouraging. One Kigwema Naga made a good sale of cauliflowers and cabbages in the Kohima market.

(VI) Lushai Hills

The agricultural staff in the Lushai Hills consisted of one Agricultural Instructor and 2 Agricultural Demonstrators, who were engaged in carrying out demonstrations with improved varieties of different crops and fruits.

2. *Paddy*—Paddy is the main staple crop in these hills. The general condition of the crop this year was very good, as the weather was favourable for its growth.

3. *Potato*—Potato is grown at a few centres on high elevations by *jhuming* as summer crop, and a small quantity is grown as winter crop in garden with manure. During the year, the general condition of the crop, both summer and winter, was very good and potato was being sold

in every bazar day at about two annas per seer. For renovation of seeds, 2 maunds of Up-to-date and Italian White potatoes were obtained from the Upper Shillong Farm. The seeds were distributed to the potato growing centres for sowing as winter crop. The Up-to-date variety was reported to be promising, which would be continued in *jhum* areas as summer crop this year. Italian White was not doing well.

4. *Sugarcane*—The cultivation of sugarcane has become very popular in the district for *gur* making, which is daily sold and consumed by the people. The general condition of the crop this year was good, as the weather was favourable.

5. *Plaintain*—Plaintain grows luxuriantly in these hills, but as the local varieties are very limited 8 improved varieties were tried last year in the Government Garden. The condition of the crop was promising.

6. *Cotton*—Cotton is generally grown in these hills as a mixed crop in *jhum* land, along with paddy. Some are sown as clean crop in bamboo areas for export. The general condition of the crop this year was good, owing to favourable weather, but the area in cultivation was much less than that of the previous years—owing to absence of market demand. People are being encouraged to turn their produce of raw cotton into manufactured product, for which there is a ready market.

7. *Vegetables*—Assorted English vegetable seeds, worth Rs.17-8-0, were distributed to the Chowkidars of the Inspection Bungalows for growing. Rupees 7-8-0 worth of tomato seeds were also distributed and tried as an experiment in villages near Aijal as winter crop.

8. *Fruits*—Orange is the most important fruit crop in these hills. The general condition of the crop as well as yield this year was very good. During the year oranges valued at about Rs.13,200 were exported to the plains from Sairang alone. In view of the fact that Lushai Hills have become one of the cheapest markets for orange in the province, it would be very beneficial if the people could be helped in marketing their produce in the plains in a systematic way. Attempts for growing improved fruits and grafting indigenous plants with improved varieties in the homestead gardens in the villages near Aijal were being made with success. During the year, 4 peach, 33 plum,16 walnut, 10 Tangelo, 8 grape fruit and 2 pear grafts were made.

9. *Distribution of Seeds*—The statement below shows the quantity of seeds, plants, etc., distributed during the year :—

Serial No.	Name of crop	Number of plants issued	Quantity of seeds issued
			Md. sr. ch.
1	Orange Seedlings	594	......
2	Singapuri Pineapples	1,103 suckers	......
3	Queen ,, ...	915 suckers	......
4	Sugarcane setts	1,217	......

Serial No.	Name of crop	Number of plants issued	Quantity of seeds issued
			Md. sr. ch.
5	Groundnut		1 36 0
6	Paddy—Latisail		1 32 0
7	Paddy—Manipuri		0 11 0
8	Paddy—Balam		0 2 0
9	Naga Paddy		2 0 0
10	Pomelo seedlings	2	......
11	Guava ,, ...	2	......
12	Litchi ,, ...	18	......
13	Pomegranate ,, ...	328	......
14	Grafted plums	2	......
15	Cardamum	40	......
16	Wild apples	4	......
17	Guinea grass cuttings	557	......
18	Rose Apple	3	......
19	Pear	1	......
20	Chestnut	3	......
21	Walnut	2	......
22	Pineapple suckers	815	......
23	Orange seedlings	320	......
24	Coffe ,, ...	250	......
25	Mango seeds	14	......
26	Onion bulbs		1 0 0

V. EXPERIMENTAL STATIONS

During the year under report, the Department had three paddy experiment stations at Karimganj, Habiganj and Titabar, one research station at Jorhat, two fruit experiment stations at Shillong and Burnihat and three cattle breeding farms at Upper Shillong, Sylhet and Khanapara. There was also a cattle section attached to the research station at Jorhat and a demonstration farm at Haflong.

Accounts of the progress of work in these stations, excepting those of the general sections of the three paddy experiment stations and the Jorhat Farm, will be found elsewhere in this report. A brief resume of the work done in the general sections of these four experiment stations is given below:—

(i) *Paddy Experiment Station, Karimganj*

The general section of the Paddy Experiment Station at Karimganj was under the control of the Deputy Director of Agriculture, Surma Valley. It is concerned with the multiplication of seeds of improved strains for distribution and sale.

Season—The total rainfall during the year was 129·98". The weather was on the whole quite seasonable with a uniform distribution of rainfall.

Insect Pests—During the year, the crops were generally free from insect pests. There was, however, a slight attack of rice bugs and rice hispa, which was brought under control in time. The damage done by ripersia sachhari was also very insignificant. Agrotis caterpillars were conspicuous by their absence in the winter crops.

Paddy—All the recommended types were grown for multiplication of seed. Among these varieties, Murali 175/1 (Dhala Jali) and the *aus* cross 536/143 (Hybird) were recently handed over to this section by the Botanical Section for testing them on a field scale. Besides these two varieties, three other varieties, *viz*., (I) M.175/2 (Dhalajali), (2) *aus* cross 536/48 (Hybrid) and (3) *sail* cross 638/3 (Hybrid), were also given a trial, but as these varieties did not show any promise they were discarded. During the year, the following recommended varieties of paddy were grown for propagation of seeds on an area of 67·43 acres (including the double cropped areas and an area of 8·49 acres under the Botanical Section) :—*Aus*—D.138/6 Tepi Dumai, C.148/1 Chengri, M.36/30 Baurashmurali, M.142 Kaimurali, M.175/1 Dhalajali, As.2. Kachalat, As. 3. Basmati, As.24/1 Basantabahar, As.46. Ausjaria and As.C. 536/143 Hybrid. *Sail*—S.22. Latisail, S.155. Badshabhog, S.156. Nagrasail, S.161. Dhepisail, S.C.54/60 Vijoisail, S.C.94/47 Kerrsail, S.C.671/16 Hybrid, Ar.1. Sailbadal, Ar.2. Laki, Ar.108 Dhalabadal and Ar.353/148 Hybrid.

The total yield of paddy, during the year, was 1,876 maunds 22 seers (*aus*—355 maunds 7 seers, *sail* and *asra* 1,307 maunds 33 seers). Out of these, 1,567 maunds 31 seers are available for distribution. Besides, 95 maunds 10 seers were kept for farm use. The cost of production (excluding the area under the Botanical Section) was Re.1-0-3 per maund.

The following experiments were conducted in the general section:—

(1) *Manurial Experiment in Sail*—A green manuring experiment was started with Dhaincha, cowpea and sunnhemp. But as cowpea and sunnhemp did not grow well owing to constant rainfall, the experiment was then altered with the following treatments:—

Treatments: (A) Check, (B) Dhaincha, (C) Cowdung at 200 maunds and (D) cowdung at 400 maunds per acre.

Arrangement—Latin square (4 × 4)

Size of plots—65′ × 18′ (1/37·23 acre)

Variety—Nagrasail.

Dhaincha—sown on 23rd March 1939 at 1 maund per acre and ploughed down on 3rd June 1939.

Cowdung—applied firstly on 20th March 1939 and secondly on 28th June 1939. Transplanted on 11th August 1939 and harvested on

Pan of the Exptt.					(Yield per acre in lbs.)		
Gr.	Straw	Gr.	Straw	Gr.	Straw	Gr.	Straw
A.101·76	111·85	C.101·64	122·15	B.102·96	138·06	D.89·83	123·08
C. 91·02	128·7	D. 90·41	128·70	A. 91.11	104·36	B.86·17	130·10
D. 88·84	144·61	B. 87·74	134·78	C. 96·70	132·91	A.88·72	81·91
B. 97·40	139·46	A. 92·09	91·26	D. 82·92	127·76	C.98·75	116·06
1		2		3		4	

Yield	Straw yield in lbs.							
	A	B	C	D	Mean	S.E·	C.D.	Remarks
Pounds per plot.	97·34	135·06	124·96	131·04	122·03	2·76	9·55	Significant by Z test.
Pounds per acre.	3624	5048	4652	4879	4551	102·8	355·5	

B D C>A

Grain Yield in Pounds

Yield	A	B	C	D.	Mean	S.E.	C.D.	Remarks
Pounds per plot.	93·42	93·57	97·08	88·0	93·0	2·41	..	Not significant by Z test.
Pounds per acre.	36·24	50·48	46·52	48·79	45·51	102·8		

B D C>A

(2) *Rotation Experiment*—On the suggestion of the Economic Botanist, Assam, a rotation experiment was laid out in two groups :—

1st Crop		2nd Crop
Group I—Kaimurali		Rabi crops—(1) Oats, (2) Barley, (3) Peas, (4) Kalai, (5) Linseed, (6) Mustard.
		3rd Crop
Group II— Ditto	Sail—Latisail :	Rabi crops—Ditto.

As the rabi crops did not come out well, the results were not calculated.

(3) *Asra Fodder Experiment*—A fodder experiment in *asra* was started with Dhalabadal with the following treatments :—

(*a*) No cutting, (*b*) One cutting (26th August 1939), (*c*) Two cuttings (25th July 1939 and 26th August 1939).

Arrangement—Randomised blocks. Replications—4.

Size of plots—50′ × 15′ (1/54 acre). Variety—Dhalabadal.

Manuring with cowdung at 300 maunds per acre.

Plan of Experiment

	C	B	A	B	A	C	
	113·0 122·9	262·4	..	269·4	..	116·1 94·1	3
Green .. 4	235·9					210·2	
Grain ..	19·88	35·79	44·71	26·14	43·60	19·56	
	A	C	B	C	A	B	
		118·2 121·5	..	119·2 96·4	..	234·2	2
1	Green	239·7	278·7	215·6			
Grain ..	54·48	25·05	34·33	26·88	49·09	37·99	

Yield of Green Fodder

Treat-ment	Cut-tings	Dates	Pounds per plot				Mean Lbs. per acre		Remarks
			1	2	3	4			
B	I	26th August 1939.	278·7	234·2	269·4	262·4	261·2	14105	
C	1	25th July 1939.	118·2	119·2	116·1	113·0	116·6	6296	
									12166
	2	26th August 1939.	121·5	96·4	94·1	122·9	108·7	5870	

Yield	B	C	Mean	S.E.	C.D.	Remarks
Pounds per plot	261·18	225·35	243·26	6·26	28·16	Treatments significant by Z test.
Pounds per acre	14103	12169	13136	338·0	1521	

B > C

Grains in pounds per plot—less 30 lbs.

Treatments	1	2	3	4	Total	Mean
A	24·48	19·09	13·60	14·71	71·88	17·97
B	4·33	7·99	—3·86	5·79	14·25	3·56
C	—4·95	—3·12	—10·44	—10·12	—28·63	7·16
Total ..	23·86	23·96	—0·70	10·38	—57·50	4·79

Yield	A	B	C	Mean	S.E.	C. D.	Remarks
Pounds per plot ...	47·97	33·56	22·84	34·79	1·48	5·12	Treatments significant by Z test.
Pound per acre ...	2590	1812	1233	1879	79·92	276·5	
Percentage on mean	137·9	96·5	65·65	100	4·25	14·71	

A> B> C

Besides the experiments mentioned above, the following crops were grown in the General Section :—jute, sugarcane, vegetables, rabi crops, such as oats, lineseed, barley, pees, *kalai* and other miscellaneous crops.

Jute—Jute was grown on an 1/10th acre plot for meeting the fibre requirements of the farm.

Sugarcane—A small plot, 0·03 acre, in block I was put under Co.313 in 1937-38 for demonstration. It was grown as a ratoon crop in 1938-39. The area was extended by another 0·05 acre and the whole of the area was kept as a ratoon during the year under report. Two thousand setts were supplied to the Agricultural Inspector, Karimganj, and the crop as whole canes sold for Rs.16.

Vegetables—Vegetables, *viz.*, brinjal, tomato, cabbage, turnip, cauliflower, knol khol and French been were grown in the farm for demonstration and was sold for Rs.25.

Rabi crops—Oats, barley, linseed, mustard, peas and *Kalai* were grown on a very small area. Late rainfall delayed sowing which adversely affected the crop.

Miscellaneous Crops—Bamboo and betel nut palms were planted on the embankment and the roadside on the southern boundary respectively. Some *litchi*, *kagzi* and cocoanut plants were also planted. Some of them are thriving quite well.

Cattle—There were 35 bullocks at the beginning of the year of which 5, being old and unfit for draught purposes, were sold. Four bullocks were purchased, bringing the strength of the herd to 34.

Fodder crops—An area of 0·02 acres of high land was put under Napier grass. Four good cuttings of grass were obtained which was fed to the cattle. It grew quite well.

Breeding Bull—A bull from Maijdhi was brought to the farm for recuperation, which has greatly improved. This bull has proved a failure for breeding.

Construction and Repairs—An extension of the godown *verandah* was made at a cost of Rs.485-3-3. The old boundary fencing, parallel to the Public Works Department road, was replaced by new woven wire fencing. A plank ceilling was put in the Botanical Laboratory Building. The Farm School house was thoroughly repaired. Some minor repairs were made in the staff and apprentices quarters.

Instruments and Appliances—Except ordinary articles, no instruments and appliances were purchased during the year.

Visits and Inspections—During the year under report, many officers of this Department paid visits to the farm and made valuable suggestions for its improvement.

(*ii*) *Deep Water Paddy Research Farm, Habiganj*

This station, which is partly financed by the Imperial Council of Agricultural Research, is devoted primarily to the improvement of deep water *amon* and *boro* paddies. The total area of the farm is about 82 acres.

Season—The year under report was very unfavourable both for *amon* and *boro* paddy. The season started with an abnormal drought affecting very adversely the *boro* crop, which was then at its final stage, and delaying *amon* sowing. There was then heavy rainfall, which caused early and high flood. The *amon* crop, which was then too young to resist a high flood, suffered heavy loss. Later on, the season continued to be normal.

Paddy—The whole of 36 acres under non-experimental work was cultivated for multiplication of the six recommended strains of paddy evolved at this station. The strains grown were :—

Boro—(1) B.111—17, (2) B.43 and (3) B.78.

Amon—(1) A.13—20, (2) A.192 and (3) A.38—13.

The table below shows the acreage under the above varieties, their yield, quantity distributed, etc., during the year under report :—

Variety		Area under cultivation	Total outturn in maunds	Outturn in lbs. per acre	Quantity of seed distributed (in round figures in maunds)
Amon—					
A. 13—20	... ...	6·39	130	1681	117
A.192	... ...	19·06	375	1619	333
A. 38—13	... ...	1·69	31	1542	29
		27·14	536		479
Boro—					
B.111—17	... ...	5·30	145	2214	158
B. 4	... ...	3·14	78	2050	75
B. 78	... ...	0·25	6	1886	5
		8·69	229		238
Grand total	...	35·38	765	...	717

Some quantity of recommended varieties, used as standard in experiments, was available as seed.

The outturn of 27 maunds of *boro* per acre, obtained during the year, cannot be said to be satisfactory. Most of the area used for the multiplication of *boro* seeds is naturally unsuitable for the crop, even after abandonment of considerable portions since 1938. Combined with this unsuitable character of the soil, the unfavourable season that prevailed during the year was responsible for low yield.

The outturn of 20½ maunds of *amon* per acre, obtained during the year, was also far from satisfactory. Here also the main cause of the low yield was unfavourable weather.

There was a great demand for our recommended varieties of paddy. About 60 maunds of *amon* and *boro* seeds were sold locally, which quantity could meet only a fraction of the total demand. The present acreage under *boro* and *amon*, particularly that under *boro*, is not sufficient to meet the growing demand for improved seeds. Hence, steps should be taken for the extension of the acreage.

Miscellaneous

(*a*) *Jute*—Jute was grown on an area of 0·12 acre only to meet the farm requirements. The crop did not grow well.

(*b*) *Banana*—The banana plants, which used to fetch an income during the last four years, are gradually dying out in spite of manuring and earthing. The land has, perhaps, been exhausted. It is intended to replant the area after a fallow of 2 or 3 years.

(*c*) *Acquatic Grasses*—The total area under acquatic grasses, predominantly *jhora*, is at present about 9 acres, including *bil* land and abandoned *boro* land. Both seeds and suckers of *jhora* were planted, taking care that its growth is not smothered by any other unwanted weeds. During the year, a small amount was obtained from sale of grasses and it is expected that an increased income will be derived in future.

(*d*) *Fish*—Fry of *Katla* and *Rohit* fishes, worth about Rs.40, was put in the three big tanks of the farm from time to time. At the time when the fish was fetching an income to the farm, the tanks were flooded and many of the grown fish escaped. It is intended to put in more fry next year.

(*e*) *Reelamation and Regularisation of Fields and Blocks*—The *boro* and *amon* lands of the farm consisted of innumerable small terraces with most irregular size and shape at the time of taking possession of the land. Since then gradual regularisation and straightening of bunds have been going on. Out of 58 acres under cultivation, about 24 acres have so far been regularised and made into blocks.

(*f*) *Farm Quarters, Buildings and Miscellaneous Urgent Necessities of the Farm*—The staff quarters of the farm were built on a purely temporary basis at the beginning, entirely of bamboo. The small amount of money provided for annual repairs was being used to repair these quarters and other semi-permanent buildings. The staff quarters have now become uninhabitable. As many as 7 houses of the farm were blown down by the cyclonic storm during the month of May and other quarters were badly shaken. The seven houses have, however, been reconstructed on a semi-permanent basis at a cost of Rs. 1,532-13-0 during the year under report. The other houses were also repaired at a cost of Rs. 2,329-14-3. Great difficulty is being felt here due to want of sufficient thrashing floor. We have at present 4,200 square feet of floor, which is inadequate for both experimental and non-experimental purpose. Harvested and thrashed paddy are required to be stacked

for days together to find floor for thrashing and drying. At present, we have bins for storing about 300 mds. of seed paddy in good condition, the rest being stored in bamboo Doolis. With the increase in production, immediate provision for permanent storage is necessary.

(*g*) *Cattle*—There was 21 bullocks at the beginning of the year. During the year, 3 bullocks died, two of Rinderpest and another of suspected pasture poisoning. Four bullocks were purchased towards the close of the year. The present number of bullocks is quite inadequate for the area under cultivation. Comparing with the bullock strength of other farms, we are short of 5 pairs of bullocks which is a great handicap to timely and proper cultivation. This farm has to plough and finish preparations of 58 acres of land at a stretch within a period of 2 months to obtain optimum results. Thrashing of paddy goes on simultaneously. Ploughing of *boro* for transplantation, first ploughing of *amon* after harvest and thrashing of *amon* go on simultaneously from November to December. Again, final preparation for *amon* sowing and *boro* thrashing go simultaneously from the middle of March to the middle of May. Work of this nature is unmanageable with the present number of bullocks. Provision for at least another 6 pairs is therefore a pressing need.

(*iii*) *Paddy Experiment Station, Titabar*

The general section of the station is mainly concerned with field scale trials of the improved types of paddy evolved by the Botanical Section and with the propagation of pure seed paddy of the recommended strains for distribution to the paddy growers.

Season—The total rainfall during the year was 75·5″ and the distribution was not regular. Excess of rainfall and drought encouraged rank growth of weeds and adversely affected the *ahu* crop. There was a long spell of drought in August which acted very adversely on the *sali* crop.

Paddy—During the year under report, 12·30 acres were under *ahu*, 48·32 acres under *sali*, 8·5 acres under the Botanical Section, 3·8 acres under seed bed and 24·57 acres were leased out and the rest of the area was under the residential block and grazing grounds.

Out of 12·30 acres under ahu, about 7 acres were harvested and the rest fed to cattle as the crop was totally smothered by weeds. The total quantity of *ahu* paddy produced was 55 mds. 24 srs., the average outturn being 4 mds. 21 srs. per acre and the average cost of production per maund Rs.4.

Under the Titabar condition broadcast *ahu* always suffers very badly from drought and heavy infestation of weeds. These factors lower the outturn and raise the cost of production per acre to a very high figure. Propagation of seed of broadcast *ahu* paddy has, therefore, been transferred to the Kokilamukh Farm from the year 1940.

The total area under *sali* was 48·32 acres, including the double cropped area. The total yield of paddy was 1,277 mds. 36 srs. Out of this, 1,170 mds. 20 srs. were available as pure seed paddy. The remaining quantity of 107 mds. 16 srs. was not pure and was sold locally for consumption. The average outturn per acre was 26 mds. 14 srs. and the average cost of production per maund was annas fourteen only.

The recommended varieties of paddy grown were —(*a*) *ahu*—Rangaduria, Fapori, Garam, Ausjaria*, Kasalar*, Basmati*, Dumai 138/6* and Murali 36/30*.

* Selections from the Karimganj Farm.

(*b*) *Sali*—Vijoysali*, Latisali*, Kerrsali*, Prashadbhog*, Latamaguri, Laudumra, Bengalijoha, Johori, Lakhijoha, Gamiribora, Badshabhog* and T.T. B. cross.

Over and above these, Kanaimuluk, Dhusari and Dadkhani, which are high yielding types of paddy with better quality, were given field scale trial for multiplication of seeds.

The following cultural experiments were also conducted in the general section :—

(1) Top cutting experiment with Latamaguri (sali) and Dhalabadal (asra).

(2) Green manuring experiment with sunnhemp and in combination with cowdung and lime.

The results of both the experiments are given in the report of the Economic Botanist, Assam, in Appendix II of this report.

Miscellaneous Crops—Soybean, *til*, potato, mustard, linseed, chilli and cigarette tobacco were grown quite successfully. Due to the want of a barn house cigarette tobacco could not be cured properly.

Fodder—Teosinthe, broom corn, maize, Guinea and Napier grasses were grown. Two silo pits were made with these grasses and the silage was fed to the cattle.

Poultry—There is a small poultry stock. It consists of White Leghorn and Rhode Island Reds, of which the latter has found favour with the public. Both the breeds have been multiplied.

Bull—One Scinde bull is being maintained with a subsidy from the Deputy Director of Agriculture, Livestock. The bull is quite healthy, serviceable and fit for local cows.

Bullocks—There were 42 bullocks in the beginning of the year. Out of them 6 died and 4 were lent to the Kokilamukh Farm. Three new pairs were purchased. Some of the bullocks are ageworn and not fit for service.

(*iv*) *Agricultural Experiment Station, Jorhat*

The General Section of this station is mainly concerned with the multiplication of selected varieties of sugarcane and the manufacture of *gur*.

Season—The season in general was not favourable for sugarcane due especially to unequal distribution of rainfall. The average outturn of the crop was, therefore, poorer than usual, especially in plant canes.

Sugarcane—During the year, 10·5 acres were under non-experimental sugarcane, of which 6·2 acres were under ratoons and 4·3 acres under plant canes.

All available materials were planted for meeting the increasing demand for sugarcane setts and 84,700 setts were issued from the station during the year.

An yield of 59 mds. 31 srs. 4 chs. of *gur*, valued at Rs.298-14-6, was obtained per acre at a cost of Rs.169-3-6.

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* Selections from the Karimganj Farm.

A field planted with some of the recommended varieties of cane last year was ratooned this year with only general treatment, as usual. The table below shows the results obtained :—

Variety	Yield in lbs. per acre		
	Stripped cane	Juice	Gur
Co. 313	51,880	29,480	5,980
Poj. 2878	58,200	34,320	5,800
Poj. 2714	44,400	25,260	4,720
Co. 419	52,000	30,220	4,760
Co. 290	41,500	24,440	4,620
Co. 421	67,900	39,760	6,960
Co. 361	48,300	...	4,080

Sugar and Gur-Making—The Rohilkhand Bel furnace continued to do good work in the large scale production of *gur*. Begasse obtained from the crusher was put straight into the furnance along with dry Begasse as fuel in the ratio of 1 :3 quite successfully. The quality of *gur* prepared at the farm was good. Preservation and storage of *gur*, in earthen ware pots sealed in paraffin or in empty Kerosene oil tins duly soldered, gave good results.

Khandshari sugar was made from the pure varieties, Poj. 2714, Poj. 2878 and Co. 419, on an experimental scale. Sugar was quite good and the by-product molasses were sold at Rs.3 a maund.

Compost Making—Compost making with refuse matters and rank vegetation was done on a large scale, with great success.

Fruits—A number of grafts of grape fruit and Chinese and Mazaffarpuri litchies were raised for distribution in the Rural Reconstruction Centres.

Fodder—Grass and pasture land was improved by following a practice of manuring and hoeing, which increased the output of fodder appreciably.

Ensilage by pitting Uridal and other wild grasses was also successfully done and this was relished by the cattle.

Livestock—There were 26 bullocks in the farm, of which 15 belonged to the general section. During the year three pairs of Behari young bullocks were purchased for Rs. 510.

Pests and Diseases—There was no serious pest infestation or outbreak of disease during the year.

Visits—I visited the farm in July, 1939 and February, 1940 and the Deputy Director of Agriculture, Upper Assam Valley and the Economic Botanist, Assam inspected it constantly.

VI HONORARY ORGANISERS

During the year under report there were 189 Honorary Organisers—61 in Sylhet, 19 in Cachar, 16 in Nowgong, 21 in Sibsagar, 10 in Lakhimpur, 1 in Sadiya, 29 in Kamrup, 13 in Goalpara, 13 in Darrang, 1 in the Garo Hills, 3 in the Khasi and Jaintia Hills, 1 in the Naga Hills and 1 in the Manipur State. The names and addresses of the Honorary Organisers are given below :—

SYLHET

1. Babu Promoth Nath Das, Post Office Beanibazar.
2. ,, Rajendra Narayan Chowdhuri, B.L., Post Office and Village Pailgaon.
3. ,, Baneswar Singha, Rarhisal, Post Office Bekiteka.
4. ,, Nagendra Narayan Chowdhuri, Village Bhatera, Post Office Bhatera.
5. ,, Motilal Acharjee, Village and Post Office Pagla.
6. ,, Kamini Kumar Pal, B.L., Srimangal, Village Rupaspur.
7. ,, Kiron Kumar Das, Post Office Gochapara, Village Damodarpur.
8. ,, Jatindra Mohan Singha, Zamindar, Village Uttarbhag, Post Office Indeswar.
9. ,, Nagendra Kumar Chowdhuri, Zamindar, Sunamganj.
10. ,, Pabitra Nath Choudhury, Village Sichni, Post Office Jagannathpur.
11. ,, Gangadhar Tusnial, Sripur Tea Estate, Jaintiapur Post Office.
12. ,, Jogendra Kumar Singh, Village and Post Office Badarpurghat.
13. ,, Rajani Kanta Nath, Paldahar, Post Office Ratabari.
14. ,, Prafulla Chandra Adhikari, Palash, Sunamganj Post Office.
15. ,, Jatindra Nath Nandi, Village Charbhitia, Post Office Balaganj.
16. ,, Abani Kanta Ghosh, Village Kanaipur, Post Office Nabiganj.
17. ,, Gopendra Nath Chowdhury, B.A., Head Master, Pagla Middle English School, Pagla.
18. ,, Ramapati Chakravarty, Village Haripur, Post Office Hatimganj.
19. ,, M. N. Dutt, Manager, Rungicherra Tea Estate, Post Office Prithimpasha.
20. ,, Priyanath Sen, Village Charinao, Post Office Brahmanchura.
21. ,, Thaiba Singh, Village Tilakpur, Post Office Bhanugach.

22. Babu Hrishikesh Chandra Chaudhury, B.SC., Chauhatta, Sylhet.
23. „ Surendranath Purkayastha, Post Offiice Balaganj, Village Lakhipur.
24. „ Nalinimohon Kar, Zemindar, Post Office Kulaura, Village Karergaon.
25. „ Gopikaranjan Mitra, Post Office Hingajia.
26. „ Sanatkumar Ghose, Post Office Chakapon, Village Kanahar.
27. „ Girijananda Chowdhury, Post Office Pukra, Village Pukra.
28. „ Anandamohon Kar, Post Office Khadimnagar, Village Kumargaon.
29. „ Mathurakanta Das, Post Office and Village Murabda.
30. „ Nripendralal Deb Roy, Post Office and Village Jagatsi.
31. Maulavi Dewan Abdul Rob Chowdhuri, B.A., Zamindar, Gaharpur.
32. „ Abdul Waheb, Pleader, Maulavibazar.
33. „ Muhammad Asraf Hussain, Sahitya Ratna and Kabyabinode, Post Office Munshibazar.
34. „ Abdul Rahman Chowdhury, Village Amura, Post Office Golapganj.
35. „ Syed Yewar Bakth Chowdhury, Zamindar, Village and Post Office Afruzaganj.
36. „ Masaddar Ali, Village Lowai, Post Office Sylhet.
37. „ Abdul Awal Chaudhury, Village Bhanga, Post Office Sridharpur.
38. „ Sakhawutul Ambia, Islam Asram, Post Office Afruzganj.
39. „ Golam Siddque Hussain, Village Malikpur, Post Office Chattak.
40. „ Dewan Ansaf Roza Chowdhury, Village Duhalia, Post Office Duarabazar.
41. „ Sikandar Ali Khondkar, Jaintiapur.
42. „ Zahiruddin Chowdhury, Post Office Dakhinbhag.
43. „ Mohiuddin Ahmed Chawdhury, Post Office Naraincherra, Village Gayasnagar.
44. „ Md. Mamoon Chowdhury, Village Bongaon, Post Office Lugaon.
45. „ Munshi Arzad Ali, Secretary, Sonatola Samabaya Samity, Post Office Akhalia.
46. „ Munshi Zilla Meah, Barbari, Post Office Dullabhcherra.
47. „ Moin Uddin Chowdhury, Village and Post Office Atgram.
48. „ Rehan Uddin Chowdhury, Kulaura.
49. „ Masihuddin Chowdhury, Fulbari, Post Office Golapganj.
50. „ Mamtaz Ali Choudhury, Chhota Faud, Post Office Atgram.
51. „ Hatim Ali, Village Parbatpur, Post Office Chatul.

52. Maulavi Md. Abdul Kuddus, Village Kadupara, Post Office Narayanchara.
53. ,, Joad Raja Chaudhury, Village Simultala, Post Office Chhatak.
54. ,, Idris Ali Chowdhuri, Village Sherpur, Post Office Jagannathpur.
55. ,, Abdul Sowab Chowdhury, Village Kargaon, Post Office Nabiganj.
56. ,, Md. Hamid Baksh, Village Chatpara, Post Office Narapati.
57. ,, Abdul Aziz, Post Office Sylhet, Village Lakripara.
58. ,, Md. Arjod, Post Office Akhalia, Village Sonatola
59. Rai Sahib Joynath Nandi Mazumdar, Post Office Bezura.
60. ,, ,, B. M. Deb, Post Office Gopaltillah, Village Rainagar.
61. Khan Bahadur Mir Mufizur Rahman, B.A., Post Office Dayamir.

CACHAR

1. Maulavi Arkan Ali Mazumdar, Krishnapur, Silchar.
2. ,, Abdul Wahid Choudhury, Village Chandrapur, Post Office Lala.
3. ,, Sajjad Ali Barlaskar, Village Koraikandi, Post Office Udharband.
4. ,, Mafizali Bar Laskar, Chipar Sangar, Algapur Post Office.
5. ,, Abdus Samad Miah, Katakhal.
6. ,, Abdul Aziz Mazumdar, Village Krishnapur, P. O. Silchar.
7. ,, Abdul Rouf Chawdhury, Zamindar, Post Office Dullagram, Village Bhuigaon.
8. ,, Abdul Hamid Laskar, Village Salchapra, Post Office Salchapara.
9. ,, Md. Asab Ali Patwari, Village Nagdirgram, Post Office Narsingpur.
10. ,, Md. Ahimuddin Choudhury, Panchait Member, Village Khelgram, Post Office Silchar.
11. ,, Md. Abdul Aziz Mazumdar, Village Kanakpur, Post Office Silchar.
12. Babu Mohendra Chandra Das, Phulbari, Silchar.
13. ,, Dhaneswar Singh, Head Teacher, Lower Primary School, Lakhipur.
14. ,, Mathura Mohon De, Sreeguri.
15. ,, Anukul Chandra Datta, Post Office Lakhipur.
16. ,, Nripendralal De Roy, Post Office and Village Jagatshi.
17. ,, Benode Behari Singha, Village Shibpur, Post Office Lakhipur.
18. Rai Bahadur Mahendra Chandra De, M.A., B.L., Silchar.
19. Mr. H. Emblen, Manager, Poloi Tea Estate, Post Office Poloi.

NOWGONG

1. Rai Sahib Bhogdutta Hazarika, Mauzadar, Post Office Dharamtul.
2. Srijut Chandra Nath Phukan, B.A., Mauzadar, Kuthori, Jakhalabanda Post Office.
3. ,, Golok Chandra Barthakur, Village Akuhichook, Post Office Kuaritol.
4. ,, Lakhikanta Barua, Kusumtali Farm, Post Office Messa.
5. ,, Golok Chandra Hazarika, Nowgong.
6. ,, Satya Hash Goswami, Nowgong.
7. ,, Chandra Kanta Barkakaty, Athgaon Post Office.
8. ,, Harikanta Hazarika, Bahrampur, Nowgong.
9. ,, Laksminath Barua, Kusumtali Farm, Messa Post Office.
10. ,, Manik Chandra Khound, Jakhalabanda Post Office.
11. ,, Ghanakanta Gogoi, Gendhaligaon, Samaguri Post Office.
12. ,, Puspadhar Khound, Jakhalabanda Post Office.
13. Maulavi Abdul Kassim Sarkar, Erabari, Juria Post Office.
14. ,, Kashimuddin Sarkar, Arabari, Juria Post Office.
15. ,, Abdul Kashim, Alitongari, Juria Post Office.
16. Mr. A. White, Killing Valley Tea Estate, Post Office Jagiroad.

SIBSAGAR

1. Mr. B. P. Barua, Manager, Monomoy Tea Estate, Lahing, Post Office Nankachari.
2. Srijut Goleswar Khound, Cinnamara Post Office.
3. ,, Indeswar Chakravarty, Teok Post Office.
4. ,, Rama Kanta Barua, Mauzadar, Kacharihat, Golaghat Post Office.
5. ,, Somenath Phukan, Lahing, Jhanji Post Office.
6. ,, Nabin Chandra Goswami, Dhapkata, Jorhat Post Office.
7. ,, M. N. Phukan, B.L., Headmaster, High English School, Dergaon, Golaghat Post Office.
8. ,, Jojneswar Sarma, Mauzadar, Bokakhat, Golaghat Post Office
9. ,, Deokon Mohanta, Namtidol Post Office.
10. ,, Bhuban Chandra Bhuyan, Kaloogaon, Post Office Sibsagar.
11. ,, Kamal Chandra Goswami, Cinnamara Post Office.
12. ,, Seniram Saikia, Secretary, Dilihi Dhaiali Agricultural Association, Sibsagar.
13. ,, S. Phukan, Bhagyalaksmi Agricultural Farm, Kharikatia, Post Office Jorhat.
14. ,, Ramprasad Saikia, Village Jalukgaon, Jhanji, Post Office Saringaphulbari.
15. Babu M. N. Roy, Deopani Sugacane Farm, Deopani Post Office
16. Maulavi Abdul Hamid, Proprietor, Kuhiarbari Tea Estate, Titabar.

17. Maulavi Syed Hafiz Ahmed Hussain, Kacharihat, Post Office Golaghat.
18. „ Syed Abdul Jabbar, Post Office Kakajan.
19. „ Azhar Hussain Hazarika, Pineapple Farm, Post Office Barpathar.
20. „ Habibur Rahman, Secretary, Samaguri Krishak Samity, Post Office Namtidol.
21. „ Motiur Rahman, Proprietor, Biringajan Tea Estate, Titabar.

LAKHIMPUR

1. Srijut Jogananda Barua, Mauzadar, Nahorkatiya Post Office.
2. „ Joga Kanta Barua, Dangalpara, Barbam Post Office.
3. „ Dandidhar Photuali, Dangri, Post Office Talap.
4. „ Gopal Chandra Datta, Mauzadar, Post Office Dhakuakhana.
5. „ Jadhav Chandra Khaklari, Prithunagar Tea Estate, Tengakhat Post Office.
6. „ Golap Chandra Goswami, Head Pandit, Middle Vernacular School, Bihpuria Post Office.
7. „ Bombeswar Sarma, Mauzadar, Machkhowa Post Office.
8. Maulavi Enayetullah Ahmed, Kashikata Tea Estate, Bihpuria Post Office.
9. „ Asraf Ali Hazarika, Mauzadar, Kadam, North Lakhimpur.
10. „ Gohar Ali, Chariali, Khowang Post Office.

SADIYA FRONTIER TRACT

1. Babu Salil Kumar Sen Gupta, Saikhowaghat Post Office.

KAMRUP

1. Rai Sahib Pratap Narayan Chowdhury, Mauzadar, Khata, Post Office Nalbari.
2. Srijut Prafulla Chandra Barua, Kamarkuchi, Post Office Athgoria.
3. „ Umesh Chandra Chowdhury, B.L., Uzan Bazar, Gauhati.
4. „ Prangopal Pathak, Post Office Howli.
5. „ Gangaram Das, Village Sandhya, Post Office Nalbari.
6. „ Kiron Chandra Chowdhury, Mauzadar, Parakuchi, Post Office Palashbari.
7. „ Chandra Nath Chowdhury, Mauzadar, Patidarang, Village Muktapur, Post Office Baihata.
8. „ Jogendra Nath Barua, Retired Judge, Gauhati.
9. „ Jaiguram Salai, Chayagaon, Alagjhari.
10. „ Kamalram Barua, Village Silsakoo, Post Office North Gauhati.
11. „ Hridoy Chandra Patwari, Village Ukhra, Kamarkuchi Post Office.
12. „ Nagarmall Agarwalla, Gauhati.
13. „ Prabhat Chandra Chowdhury, Nalbari Post Office.

14. Srijut Damodar Sarma, Chandkuchi, Nalbari.
15. ,, Romesh Chandra Chowdhury, Mauzadar, Bortair Village Post Office Sarupeta.
16. ,, Nandamohon Mazumdar, Member, Local Board, Dakhin Ganakgaon, Post Office Sorbhog.
17. ,, Dinanath Sarma, Pathsala Post Office.
18. ,, Tarjuram Bepari, Post Office Pathsala, Village Bhogpur.
19. ,, Golak Chandra Lohkar, Post Office Rangiya.
20. Babu Sasankamohon Chatterjee, Govardhan Estate, Gauhati.
21. ,, Janaklal Upadhya, Chamta, Post Office Digaru.
22. ,, Kamalram Barua, North Gauhati.
23. Rai Bahadur Rajani Kanta Chowdhury, Mauzadar, Sorbhog.
24. Rai Bahadur M. M. Lahiri, B.L., Gauhati.
25. Maulavi Tazul Islam, Sonapur, Gauhati.
26. ,, Azizur Rahman, Vidyabinode, Assistant Head Master, Government Aided R. B. High School, Palashbari.
27. ,, Sahar Ali, Local Board Member, Baihata.
28. Sheik Bhundo Goanbura, Village Sarpara, Post Office Palashbari.
29. Munshi Hamikuddin, Village Khetrapara, Post Office Chayagaon.

GOALPARA

1. Srijut Lalit Mohon Datta, Dhubri.
2. ,, Bepin Chandra Chakravarty, Village Kheksiali, Post Office Balajan.
3. ,, Soroj Ranjan Bhattacharyya, Tulingia, Post Office North Salmara.
4. ,, Debendra Nath Chakravorty, Village Tukra, Post Office Krishnai.
5. ,, Manibhusan Chakrabarty, Khudimari, Post Office Gauripore.
6. ,, Syamacharan Barua, Lalagram, Post Office Damra.
7. ,, Nirmal Chandra Barua, Head Pandit, Kokrajhar Middle English School, Kokrajhar Post Office.
8. Dr. Saral Kumar Das, Post Office Fakirgram.
9. Babu Kumud Lochan Chakravarty, Khudimari, Gauripur.
10. Kumar Bhuban Chandra Deb, Bongaigaon, Goalpara.
11. Rai Bahadur P. C. Chatterjee, Dewan of Gauripore, Goalpara.
12. Maulavi Mafizuddin Ahmed, Post Office Jamadarhat.
13. ,, Abdul Hamid Khan, Ghagmari, Post Office Fakirganj.

DARRANG

1. Srijut Monmohon Chowdhury, Mauzadar, Balipara Post Office.
2. ,, Khageswar Agarwalla, Mauzadar, Gamiri, Post Office Halem.
3. ,, Mohikanta Sarma, Post Office Kalaigaon.

4. Srijut Dhir Nath Medhi, Bughmari, Post Office Charali.

5. ,, Nabin Chandra Barua, Nagsankar, Post Office Sootea.

6. ,, C. N. Sarma, B.L., Pleader, Tezpur.

7. ,, Balaram Mudoi, B.A., Post Office Sootea.

8. ,, Kunja Nath Hazarika, Village Lehugaon, Post Office Charali.

9. ,, Bhogram Mauzadar, Post Office Behali.

10. Babu Govindaram Upadhya, Steamerghat, Tezpur.

11. ,, Sukhlal Ghosh, Mangaldai.

12. ,, Prashad Singh Shura, Lalmati Village, Tezpur Post Office.

13. Maulavi N. A. Aziz, Tezpur.

GARO HILLS

1. Khan Bahadur Abdul Latif, M.B.E., Mauzadar, Mahendraganj, Post Office Mankachar.

KHASI AND JAINTIA HILLS

1. Mr. K. M. Singh, Jaid Siem, Mairang, Shillong.

2. The Rev. L. Gatphoh, B.A., Jowai Post Office.

3. Mr. McDonald Kongor, Shillong.

NAGA HILLS

1. Mr. Hisale Angami, Mauzardar, Kohima.

MANIPUR STATE

1. Mr. W. Yumjao Singh, Superintendent, State Press of Manipur State, Imphal.

My thanks are due to the Honorary Organisers for carrying out demonstrations on their own land and for helping the Department in various other ways in bringing improvements in agriculture and animal husbandry within the easy reach of the cultivators. Of them, the following gentlemen deserve special mention for the valuable co-operation extended to the Department :—Babu Benodebehari Singh, Maulavi Abdul Wahid Chowdhury, Babu Gangadhar Tusnial, Babu Kiron Kumar Das, Babu J. M. Singha Chowdhury, Babu Thaiba Singh and Khan Bahadur Mufizur Rahaman in the Surma Valley ; and Khan Sahib Z. A. Hazarika, Srijut Indeswar Chakravarty, Maulavi A. H. Hazarika and Srijut Lakhikanta Barua in the Upper Assam Valley.

VII

CULTIVATION OF BORO PADDY ON PRECARIOUS AMON LAND UNDER IRRIGATION BY POWER PUMPS

During the year under report, the Department had 26 power driven irrigation pumps in all, 18 in the Surma Valley and 8 in the Assam Valley. A brief account of the working of the pumps is given below.

Surma Valley

In the Surma Valley, the demonstrations with power pumps were conducted by a Special Agricultural Inspector, under the supervision of the Deputy Director of Agriculture, Surma Valley. There were altogether 18 pumping setts, of which 10 were employed in actual demonstration.

With the help of these ten pumps, an area of 900 acres of land was put under *boro* paddy, from which an estimated yield of 27,000 maunds of paddy, at the rate of 30 maunds per acre, was obtained. The total value of the produce, at the rate of Rs.2 per maund (the current market rate), would come to Rs.54,000. The total expenditure incurred for running the pumps amounted to about Rs.6,540, of which the cultivators would pay about Rs.3,660. Thus at a cost of Rs.2,880 to the Government the cultivators reaped a harvest of 27,000 maunds of paddy from land which ordinarily goes without cultivation of any sort.

The statement below shows the result, in round figures, of the demonstrations in the Surma Valley for the last five years—1935-36, 1936-37, 1937-38, 1938-39 and 1939-40.

—	1935-36	1936-37	1937-38	1938-39	1939-40
1. Number of pumps worked ..	10	12	9	10	10
2. Total area irrigated and harvested.	775	1,080	740	900	900 acres.
3. Total yield of paddy ..	9,035	14,600	15,520	18,900	27,000 maunds.
4. Value of above	11,300	18,300	19,400	23,625	54,000 rupees.
5. Total working expenses (including repairing charges and depreciation).	9,750	16,140	6,460	7,280	6,540 rupees.
6. Receipts from the cultivators	2,600	4,325	3,150	4,270	3,660 rupees.
7. Net expenditure incurred by the Government.	7,150	11,815	3,810	3,010	2,880 rupees.
8. Average area harvested per machine.	77·5	90	82	90	90 acres.
9. Average cost per harvested acre	12	14	8	8	7 rupees.
10. Loss to Government per machine.	715	984	367	301	288 rupees.

It will be evident from the above table that the demonstrations were conducted somewhat more efficiently during the year than had been possible in the past. The average cost per acre has come down by one rupee and the loss incurred by the Government per machine has decreased from

Rs.301 to Rs.288. During the year under report, each pump worked on an average for 11,450 hours as compared to 16,885 hours of the previous year. The average consumption of fuel and lubricant per machine was 400 gallons and 50 gallons respectively as compared to the average consumption of 540 gallons of fuel and 55 gallons of lubricant during 1938-39.

Assam Valley

The number of pumps in the Assam Valley was 8, the same as during the previous year. Of these 5 were given to the Lower Assam Valley and 3 to the Upper Assam Valley. The Agricultural Inspectors of the Circles concerned conducted the operations under the supervision of the officers in charge of the two Divisions. In the Lower Assam Valley, with the help of 5 pumps about 148 acres of land were put under *boro*, from which an yield of 4,650 maunds of paddy was obtained. The total expenditure incurred in running the pumps came to about Rs.3,300, of which the cultivators would pay about Rs.325. One pump was kept in reserve against emergency in the Upper Assam Valley, where two pumps irrigated an area of about 150 acres. The yield of paddy there was very bad as the crop was severely damaged by hailstorm. In the Lower Assam Valley, though the yield of paddy was quite good, the work did not progress very well except in Mangaldai, where better results were obtained mainly due to the efforts of Mr. S. N. Maitra, the Subdivisional Officer.

APPENDIX V

AGRICULTURAL STATISTICS

(*A*) *Area under Improved Crops*

The statement below shows the area in acres under improved varieties of paddy, sugarcane, potato and jute in Assam, during the year 1939-40, together with the total area under each of these crops :—

Crop	Area under improved varieties of the crop	Total area under the crop	Percentage (approximate)
1	2	3	4
1. Paddy	53,032	5,351,506	1
2. Sugarcane	13,795	38,542	35·8
3. Potato	13,223	30,795	43
4. Jute	20,510	323,222	6
Total	100,560	5,744,065	2

The statement below shows the 1939-40 acreages under improved varieties of paddy, sugarcane, potato and jute, and the total acreages under these crops for those districts where the improved varieties have been introduced—

District	Paddy		Sugarcane		Potato		Jute	
	Area under improved Varieties	Total area under the crop	Area under improved varieties	Total area under the crop	Area under improved varieties	Total area under the crop	Area under improved varieties	Total area under the crop.
1	2	3	4	5	6	7	8	9
1. Sylhet	31,565	1,917,148	138	2,676	1,075	2,402	5,903	42,100
2. Cachar	3,322	327,375	374	6,859	48	3,377	33	226
3. Lakhimpur ..	1,870	333,771	2,833	4,627	450	3,272	120	4,090
4. Sadiya	935	9,430	112	266	239	890	Nil	Nil
5. Sibsagar.. ..	3,434	485,443	6,182	8,204	565	629	70	706
6. Nowgong.. ..	1,654	372,308	530	4 428	200	1,394	3,774	75,179
7. Kamrup	3,945	848,981	1,790	6,365	1,176	3,009	4,336	69,952
8. Darrang	2,877	396,625	1,607	3.130	529	3,882	920	25,866
9. Goal para.. ..	3,330	409,486	229	1,800	241	2,700	5,354	100,000
10. Khasi and Jaintia Hills.	100	36.000	Nil	Nil	8,700	8,700	Nil	Nil
Total ..	53,032	5,136,567	13,795	38,355	13,223	30,255	20,510	318,119

Improved Strains of Crops issued by the Department.

The research stations of the Department have issued upto the 31st March 1940, altogether 103 improved strainsof crops—40 of paddy, 20 of sugarcane and 43 of potato. The statements below give some detailed information about them.

I. PADDY

(a) *Paddy Research Station, Karimganj*

Serial No.	Strains	Date of sowing	Life period	Yield per acre in mds.	Date of issue	Discription
1	2	3	4	5	6	7
	Broadcast Aus (time fixed)		Days			
1	D.138-6—Tepi Dumai..	March—April.	78	23	1920	Grains are mottled black in colour, medium in size with red kernel. It is the earliest of all paddy grown in Assam.
2	M.36-30—Baurash Murali	,,	100	28	1920	Grains are yellow with short awns, medium in size, red kernel. Resistant to lodging.
3	M.142—Koi Murali ..	,,	93	26	1925	Grains yellow, medium with red kernel.
4	C.148-1—Chengri ..	,,	90	26	1932	Grains mottled yellow, medium with red kernel.
5	M.175-1—Dhala Jali ..	,,	95	28	1938	Grains yellow, awnless medium with red kernel.
	Transplanted Aus (Time fixed)					
6	As. 3 Basmati ..	April—May.	112	30	1923	Grains yellow, medium with white kernel. Good quality rice. Non-lodging habit.
7	As. 24-1 Basantabahar..	,,	102	26	1924	Grains brown, very fine, scented, white kernel. Much prized for its fineness.
8	As. 2 Kasalath ..	,,	110	30	1927	Grains yellow, medium with red kernel.
9	As. 46 Aus Jaria ..	,,	118	32	1929	Grains brown, medium with red kernel. Erect in habit and resistant to lodging.
10	As.C.536-143—Hybrid..	,,	106	30	1938	Grains yellow, medium with white kernel.

	Sail (Season fixed)					
11	S. 22 Latisail	June-July	150-176	40	1920	Grains yellow, coarse with white kernel.
12	S. 156 Nagrasail ..	,,	155-179	40	1923	Grains yellow, medium, fine and elongated grain with white kernel. Susceptible to disease.
13	S.61 Prosadbhog ..	,,	145-168	33	1926	Grains yellow, medium fine, white rice.
14	S.155 Badshabhog ..	,,	150-170	32	1927	Grains brown, very fine, scented with white kernel. " Polao rice".
15	S.161 Dhepisail ..	,,	160-180	41	1929	Grains yellow, coarse elongated grain with white kernel. Non-lodging habit.
16	S. C. 54-60 Vijoysail ..	,,	145-165	38	1929	Grains yellow coarse with white kernel. Early type, uniform ripening and non-lodging habit.
17	S.C.94-47 Kerrsail ..	,,	150-178	42	1929	Grains yellow, medium with white kernel. Resistant to lodging. The best of all the varieties amongst the high class winter paddy of the province.
18	S.C.671-16 Hybrid ..	,,	155-175	40	1935	Grains yellow, medium elongated with white kernel. Resistant to lodging.
	Asra (Season fixed)					
19	Ar. 1 Sailbadal ..	May-June	185-205	43	1921	Grains coarse with white kernel. Thrives well in 2-6ft. of water.
20	Ar. 2 Laki	,,	190-210	40	1921	Grains coarse with white kernel. Thrives well in 2-6ft. of water.
21	Ar.108-1 Dholabadal..	,,	195-215	48	1935	Grains coarse with white kernel. Very late type. Thrives best in 3-7 ft. of water. The highest yielder amonst all classes of paddy.
22	Ar. C.353-148 Hybrid..	,,	175-193	42	1935	Grains coarse with white kernel. Uniform ripening habit. Thrives well in 2 4 ft. of water. Early type.

(*b*) *Paddy Research Station, Titabar*

Serial No.	Strains	Date of sowing	Life period	Yield per acre in mds	Date of issue	Description
1	2	3	4	5	6	7
	Aus (Time fixed)					
23	As.86 Rangadaria ..	March-April	94	24	1927	Grains brown, medium with red kernel. Resistant to lodging.
24	As.35 Farma	,,	199	22	1934	Grains yellow medium with red kernel.
25	As.20-1 Garem ..	,,	100	26	1938	Grains yellow, medium with red kernel.
26	As. 48 Dubai Chenga ..	,,	103	26	1938	Grains yellow, medium with red kernel.
27	As.25 Fapori	,,	93	22	1934	Grains yellow, medium with red kernel.
	Sail (Season fixed)					
28	S.126 Laudumra ..	June-July	150-165	39	1933	Grains yellow, coarse with white kernel. Can withstand drought. Resistant to lodging.
29	S. 115 Latamaguri ..	,,	155-170	32	1931	Grains light yellow, medium with white kernel.
30	S.L. 240 Johori ..	,,	148-167	35	1933	Grains yellow, long medium with white kernel.
31	S.J. 226 Bengali Joha..	,	160-175	33	1931	Grains deep yellow, kernel white, scented and fine.
32	S. J. 311 Lakshmi Joha	,,	150-171	33	1935	Grains light mottled yellow, kernel white and elongated.
33	S.L.70 (*a*) Ahomsail ..	,,	145-162	40	1929	Grains yellow, medium with white kernel.
34	S. B. 279 Gomiribora..	,,	155-163	35	1931	Grains deep brown, medium with white kernel. Soft rice.

(c) Deep Water Paddy Research Farm, Habiganj

Serial No.	Name of strain	Description	Date of issue	Time of sowing	Approximate date of flowering	Average yield in mds. per acre.
1	2	3	4	5	6	7
	Aman					
35	Hbj. Aman I—A.13-20	It belongs to the *Bagdar* group and is an amber kernelled, fine, long-grained and awnless strain with furrowed husks. It grows in 5-7 feet of water.	1938	1st week of April to the middle of May.	16th October	32
36	Hbj. Aman II—A.192..	It belongs to the *Laki* group and is an amber-kernelled, medium, straw-coloured and awnless strain which grows in 8-10 feet of water.	Ditto	Ditto	21st October	39
37	Hbj. Aman III—A38-13	It belongs to the *Gowai* group and is a red-kernelled, purple-awned and coarse grained strain with husks of dull straw-colour. It can stand 10-14 feet of water.	Ditto	Ditto	29th October	32
					Period of growth (from sowing to flowering)	
	Boro					
38	Hbj. Boro I—B.111-17	It belongs to the *Boro* group and is a coarse-gained, red kernelled awned and furrowed strain.	1937 ..	November ..	120 days ..	39
39	Hbj. Boro II—B.43-111-17.	It belongs to the *Tupa* group and is a straw-coloured and awned paddy which gives white, coarse and scented rice of inflated shape.	1938 ..	Ditto ..	124 days ..	49
40	Hbj. Boro III—B.78-4-11	It belong to the *Sail Boro* group and is a straw coloured and awnless paddy which gives white and scented rice of medium size.	Ditto ..	Ditto ..	230 days ..	31

II.—SUGARCANE

Serial No	Variety	Average yield of stripped canes in mds. per acre	Percent sucrose in juice	Coefft. of purity	Average Yield of *gur* in mds. per acre	Remarks
1	2	3	4	5	6	7
1	Stripped Mauritius	828.4	15·70	96·79	82·8	A thick cane, medium in hardness, blue in colour with green stripes. Usually recumbent. Good ratooner. Liable to be damaged by jackals and other pests. Early ripener. Used also as a chewing cane.
2	B.147	705·2	17·28	93·82	70·5	A light yellow, thick and hard cane. Requires heavy manuring. Very susceptible to water-logging. Ratoons well only on rich soil. Usually does not lodge. Late ripener.
3	B.376	773·0	18·39	99·17	77·3	A thick soft cane, pale blue in colour. Good for chewing. Lodges badly. Liable to be damaged by jackals. Good ratooner.
4	J.33a	982·2	14·2	86·77	60·0	Thin hard cane, great vigour, dark blue coloured. Equally good as plant and ratoon cane. Late ripener.
5	B.3412	626·4	14·6	88·32	62·6	Light yellow coloured, medium in hardness and thickness. Good ratooner but liable to disease as ratoon crop. Late ripener.
6	D.74	565·1	15·69	90·24	56·5	A yellow, hard thick cane. Usually not a good ratoon. Lodges late in the season. Late ripener.
7	Poj. 1507	500·1	15·20	89·54	50·0	A light yellow, hard cane of great vigour, medium in thickness. Good ratooner. Late ripener.
8	Poj.2714	816·7	21·44	96·60	81·6	A thick, hard, erect cane of great vigour. Quick and vigorous in germination. Internodes long, susceptible to drought. Good ratooner, late ripener. An all-round cane.
9	B.6308	675·0	15·29	88·68	67·5	Has similarity with D.74, but it is a better yielder than D.74. Late ripener.

10	H.109	729.5	14·80	90·52	72·9	A thick hard cane of dark blue colour, usually recumbent. Good ratooner. Late ripener.
11	Co.210	721·1	14·40	87·19	72·1	A thin, hard, erect cane of great vigour, dark blue in colour. Good ratooner, resists drought remarkably. Can stand water-logging. Medium ripener.
12	Co.213	723·9	15·40	92·97	72·4	An erect cane thicker than Co.210. Good ratooner Late ripener.
13	Co.290	846·8	19·13	94·53	84·6	An erect and vigorous cane. Taller than Co. 213 and thicker than either Co. 210 or Co. 213. Very good ratooner. Medium ripener.
14	Co.313	736·0	19·44	93·15	73·6	Medium in thickness and hardness. Colour yellow. An early ripener, a good ratooner. Requires rich soil and care.
15	Poj. 2878	669·2	20·69	96·72	66·9	Thick hard cane, yellow colour, requires rich soil. A late ripener. Not a good ratooner.
16	Co.361	784·0	21·04	97·33	78·4	Medium in thickness. Reddish-yellow coloured. Medium hard. A late ripener, requires good soil. Good ratooner.
17	Co.419	1251·1	18·24	94·12	125·1	Late ripener. Thick hard, red purple cane, grows well in rich and manured soils. A good ratooner. Lodges sometimes.
18	Co.421	1092·6	18·40	97·66	109·2	Medium ripener. Thick hard cane, yellow coloured, does not lodge. A rich cane.
19	Co.355	600-700	17·27	90·70	65	Medium ripener. Medium thick cane, dull yellow-coloured, good ratooner. Requires good soil.
20	Co.356	600-700	18·60	90·56	65	Ditto ditto ditto

III.—LIST OF IMPROVED STRAINS OF POTATO ISSUED FROM THE UPPER SHILLONG FARM

Date of issue	Name of varieties
1910-11	1 King of Potatoes.
	2 Mangnum-Bonum.
	3 British Queen.
	4 Windsor Castle.
	5 King Edward VII.
	6 White City.
1914-15	7 Up-to-date.
1915-16	8 Imperator.
1922-23	9 Great Scott (1921).
	10 Arran Chief (1921).
	11 Ally (1921).
1924-25	12 Starling Castle.
	13 Epicure.
1925-26	14 Balmoral Castle.
	15 Edinburgh Castle.
1928-29	16 Darjeeling.
1929-30	17 Comrade 1929.
	18 Kerr's Pink.
	19 Bishop.
	20 Arran Consul.
	21 Ben Cruachen 1929.
	22 Factor.
	23 Snow Drop.
	24 Talisman.
	25 Eclipse.
	26 Abundance.
	27 Early Market.
	28 Ben Lomond.
	29 Red-Darjeeling.
1931-32	30 Sharps Express 1931.
	31 Dunnatar Castle.
	32 Perth Favourite 1930.
	33 Glasgow Favourite 1930.
	34 President 1930.
	35 Golden Wonder 1930.
1933-34	36 Arran Banner 1933.
	37 Majestic 1933.
1936-37	38 Inverness Favourite 1936.
	39 Shillong Local 1936.
	40 Italian White Round 1936.
1937-38	41 Commander 1937.
	42 Local Up-to-date 1936.
1938-39	43 Laitlyngkot Pink.

(1) Yield per acre in maunds under Government Farm conditions—80 to 150.

(2) Yield per acre in maunds under cultivators' conditions—70 to 120.

APPENDIX VI

DISTRICT STAFF*

(As on the 31st March 1940)

Serial number	Name	Designation	Head quarters
	I.—KAMRUP DISTRICT		
1	Babu K. K. De	Agricultural Inspector.	Gauhati.
2	Srijut B. Das	Ditto ...	Barpeta.
3	Babu T. R. Sen	Agricultural Inspector, Livestock	Gauhati.
4	Maulavi T. Ahmed	Ditto ...	Barpeta.
1	Maulavi U. Ali	Agricultural Demonstrator.	Chayagaon.
2	„ T. Neog	Ditto ...	Gauhati.
3	Srijut B. R. Bora	Ditto ...	Baihata.
4	„ S. N. Nath	Ditto ...	Hajo.
5	„ B. N. Datta	Ditto ...	Rangiya.
6	„ K. N. Datta	Ditto ...	Barpeta.
7	„ H. Das	Ditto ...	Nalbari.
8	„ R. Marak	Ditto ...	Pathsala.
9	„ J. Barua	Agricultural Demonstrator, Livestock	Barpeta.
	Maulavi S. Ahmed	Ditto ...	

* Officer of the Subordinate Agricultural Service engaged in demonstration.

Serial number	Name	Designation	Headquarters
	II.—GOALPARA DISTRICT		
1	Seikh K. Baksh	Agricultural Inspector.	Goalpara.
2	Srijut G. C. Barua	Ditto ...	Dhubri.
1	Srijut C. C. Datta Chowdhury ...	Agricultural Demonstrator.	Dudnai.
2	Seikh A. Aziz	Ditto ...	Goalpara.
3	Srijut K. N. Datta	Ditto ...	Abhoyapuri.
4	,, J. C. Talukdar ...	Ditto ...	Dhubri.
5	,, D. R. Das	Ditto ...	Sapatgram.
6	,, B. N. Bhattacharyya ...	Ditto ...	Mankachar.
7	Maulavi A. Rahaman	Ditto ...	South Salmara.
	III.—DARRANG DISTRICT		
1	Srijut D. N. Das	Agricultural Inspector.	Mangaldai.
2	Babu D. M. Sen Gupta... ...	Ditto	Tezpur.
1	Maulavi S. Rahaman	Agricultural Demonstrator.	Tezpur.
2	Srijut L. N. Barua	Ditto ...	Charali.
3	Maulavi P. Chowdhury ...	Ditto ...	Behali.
4	Srijut H. P. Chowdhury ...	Ditto ...	Dalgaon.
5	Maulavi A. Ali	Ditto ...	Kalaigaon.
6	Srijut. P. R. Keot	Ditto ...	Mangaldai.

Serial number	Name	Designation	Headquarters
	IV.—LAKHIMPUR DISTRICT		
1	Srijut L. N. Kakoti	Agricultural Inspector.	Dibrugarh.
2	„ L. C. Barua	Ditto ...	North Lakhimpur.
1	Srijut B. R. Bora	Agricultural Demonstrator.	Dibrugarh.
2	„ B. N. Gogoi	Ditto ...	Naharkatiya.
3	„ S. K. Datta	Ditto ...	North Lakhimpur.
4	Maulavi A. R. Bora	Ditto ...	Bihpuria.
	V.—SIBSAGAR DISTRICT		
1	Babu N. Ghose	Agricultural Inspector.	Jorhat.
2	Srijut M. C. Gogoi	Ditto ...	Golaghat.
3	Maulavi T. R. Hazarika ...	Agricultural Inspector, Livestock.	Jorhat.
1	Srijut N. K. Barkataki ...	Agricultural Demonstrator.	Jorhat.
2	„ A. R. Gohain ...	Ditto ...	Jorhat.
3	Maulavi I. Ali	Ditto ...	Jhanji.
4	Srijut B. Phukan	Ditto ...	Sibsagar.
5	„ B. C. Buragohain ...	Ditto ...	Golaghat.
6	„ K. R. Gogoi	Ditto ...	Barpathar.
7	Maulavi K. Huda	Ditto ...	Dergaon.
8	Srijut B. R. Miri	Ditto ...	Majuli.
9	„ M. N. Deka	Agrcultural Demonstrator, Livestock	Dergaon.

Serial No.	Name	Designation	Headquarters
	VI.—NOWGONG DISTRICT		
1	Srijut P. Barua	Agricultural Inspector.	Nowgong.
1	Srijut S. D. Barpujari	Agricultural Demonstrator.	Nowgong.
2	,, N. C. Kakoty	Ditto ...	Rupahi.
3	Maulavi P. Ahmed	Ditto ...	Roha.
4	Srijut N. Datta	Ditto ...	Kuorital.
5	Lunse Maire Teron	Lac Demonstrator.	Nowgong.
	VII.—SYLHET DISTRICT		
1	Babu D. C. Das	Agricultural Inspector.	Sylhet.
2	Maulavi A. Q. Chowdhury ...	Ditto ...	Jaintia.
3	,, A. A. Mazumdar ...	Ditto ...	Karimganj.
4	Babu P. C. Datta	Ditto ...	Maulvibazar.
5	,, R. C. Das.	Ditto ...	Habiganj.
6	,, H. K. Das	Ditto ...	Sunamganj.
7	,, J. C. Chakravarty ...	Agricultural Inspector, Livestock.	Sylhet.
1	Maulavi G. Akbar	Agricultural Demonstrator.	Sylhet.
2	Babu M. K. Das.	Ditto ...	Sylhet.
3	Maulavi A. Ali	Ditto ...	Fenchuganj.
4	Babu G. M. Das	Ditto ...	Tazpur.
5	,, S. C. De	Ditto ...	Dhakadakshin.
6	Maulavi A. Jabbar	Ditto ...	Kanaighat.
7	,, A. Aziz	Ditto ...	Jaintiapur.
8	Syed F. Rahaman	Ditto ...	Sreemangal.
9	Babu S. C. Kar	Ditto ...	Kulaura.
10	,, A. K. Datta	Ditto ...	Rajnagar.

Serial No.	Name	Designation	Headquarters
	VII.—SYLHET DISTRICT—*concld.*		
11	Babu G. C. Datta	Agricultural Demonstrator.	Maulvibazar.
12	Maulavi S. Ali	Ditto ...	Shaistaganj.
13	Babu S. C. Deb	Ditto ...	Habiganj.
14	Maulavi A. Majid	Ditto ...	Itakhola.
15	Syed A. Ali	Ditto ...	Baniachong.
16	Babu L. K. Chakravarty (I) ...	Ditto ...	Nabiganj.
17	„ G. K. De	Ditto ...	Karimganj.
18	„ C. M. Shing	Ditto ...	Patharkandi.
19	„ H. C. Malakar	Ditto ...	Latu.
20	„ H. C. Chowdhury ...	Ditto ...	Sunamganj.
21	„ L. K. Chakravarty (II) ...	Ditto ...	Jagannathpur.
22	Maulavi A. Quasim ...	Ditto ...	Chhatak.
23	„ A. Mannan	Agricultural Demonstrator, Livestock.	Sylhet.
	VIII.—CACHAR DISTRICT		
1	Babu I. C. Deb	Agricultural Inspector.	Silchar.
2	„ D. L. Pal	Agricultural Inspector, Livestock.	Silchar.
1	Maulavi A. Mannan	Agricultural Demonstrator.	Silchar.
2	„ M. Ali	Ditto ...	Lakhipur.
3	„ R. Ullah	Ditto ...	Katlicherra.
4	„ M. A. Laskar	Ditto ...	Hailakandi.
5	Babu P. K. De	Ditto ...	Katigorah.
6	Maulavi A. Rahim	Agricultural Demonstrator, Livestock.	Silchar.

Serial No.	Name	Designation	Headquarters
	IX.—KHASI AND JAINTIA HILLS DISTRICT		
1	Mr. L. L. Reade	Agricultural Inspector.	Shillong.
1	U R. Hirsing	Agricultural Demonstrator.	Shillong.
2	,, R. M. Roy	Ditto ...	Mawflang.
3	,, Mellison	Ditto ...	Nongpoh.
4	,, W. Lyngdoh	Ditto ...	Jowai.
5	,, G. Lyngdoh	Ditto ...	Shampong.
	X.—LUSHAI HILLS DISTRICT		
1	Mr. S. N. Biswas	Agricultural Instructor.	Aijal.
1	Pu Aichunga	Agricultural Demonstrator.	Aijal.
2	,, Pianghleia	Ditto ...	Lungleh.
	XI.—NAGA HILLS DISTRICT		
1	Zeoti	Agricultural Demonstrator.	Mokokchung.
2	Zelui	Ditto ...	Kohima.
3	Pukhato	Ditto ...	Kohima.
	XII.—NORTH CACHAR HILLS SUBDIVISION		
1	P. Millick	Overseer	Haflong.
2	C. Bodo	Agricultural Demonstrator.	Haflong.
	XIII.—GARO HILLS DISTRICT		
1	Babu B. Sangma	Agricultural Demonstrator.	Tura.
2	,, S. Sangma	Ditto ...	Tura.
	XIV.—SADIYA FRONTIER TRACT		
1	Mr. A. Smith	Agricultural Instructor.	Sadiya.
1	T. Jhamo	Agricultural Demonstrator.	Sadiya.

APPENDIX VII

TOURING OF OFFICERS

Serial No.	Name of officers	Number of days spent on tour during 1939-40
1	Dr. S. K. Mitra, Director of Agriculture, Assam...	133
2	Mr. F. Haque, Deputy Director of Agriculture, Upper Assam Valley.	142
3	Mr. L. Barthakur, as Deputy Director of Agriculture, Surma Valley.	121
4	Mr. R. C. Woodford, Deputy Director of Agriculture, Livestock, Assam.	62
5	Mr. L. K. Handique, Senior Marketing Officer, Assam.	36
	as Deputy Director of Agriculture, Livestock, Assam	49
6	Mr. B. B. Das, as Deputy Director of Agriculture, Surma Valley.	5
7	Mr. S. Majid, Deputy Director of Agriculture, Surma Valley.	29
8	Dr. H. K. Nandi, Economic Botanist, Assam ...	163
9	Babu N. K. Das, Assistant Marketing Officer ...	62
10	Maulavi Md. Mashahid Ali, Assistant Marketing Officer.	115
11	Maulavi Syed Madassir Ali, as Assistant Marketing Officer.	60
	as Agricultural Inspector	25
12	Babu D. C. Das, Agricultural Inspector ...	123
13	Maulavi Md. A. Quadim Choudhury, Agricultural Inspector.	121
14	Babu J. N. Chakravarty, Agricultural Inspector ...	92
15	Babu S. Roy Choudhury, Agricultural Inspector	59
16	Babu R. C. Das, Agricultural Inspector ...	157
17	Maulavi Ayubali Majumdar, Agricultural Inspector.	150
18	Maulavi A. Yusuf Ahmed, Agricultural Inspector	62
19	Babu I. C. Deb, Agricultural Inspector... ...	216
20	Babu S. C. Choudhury, Agricultural Inspector ...	235
21	Babu H. K. Das, Agricultural Inspector ...	50
22	Babu S. R. Gupta, Entomological Assistant ...	111
23	Babu B. C. Goswami, Jute Inspector	276
24	Maulavi M. Ali, Agricultural Inspector ...	57
25	Babu P. B. Ghose, Agricultural Inspector ...	208
26	Babu K. K. De, Agricultural Inspector ...	172

Serial No.	Name of officers	Number of days spent on tour during 1939-40
27	Srijut B. Das, Agricultural Inspector	273
28	Srijut G. C. Barua, Agricultural Inspector ...	146
29	Seik K. Baksh, Agricultural Inspector	212
30	Babu D. N. Sen Gupta, Agricultural Inspector ...	227
31	Srijut D. N. Das, Agricultural Inspector ...	170
32	Srijut L. N. Kakoti, Agricultural Inspector ...	203
33	Babu B. R. Datta, Agricultural Inspector ...	93
34	Maulavi N. Z. Ahmed, Agricultural Inspector ...	16
35	Babu N. Ghose, Agricultural Inspector ...	25
36	Srijut M. C. Gogoi, Agricultural Inspector ...	190
37	Srijut P. Barua, Agricultural Inspector ...	190
38	Srijut L. C. Barua, Agricultural Inspector ...	222
39	Mr. L. L. Reade, Agricultural Inspector ...	205
40	Mr. P. C. Khongwir, Fruit Inspector	23
41	Mr. A. Smith, Agricultural Instructor	238
42	Mr. S. N. Biswas, Agricultural Instructor ...	107
43	Srijut L. N. Phukon, Chemical Assistant ...	92
44	Babu H. N. Pal, Chemical Assistant (Research) ...	44
45	Babu T. N. Sen, Mycological Assistant ...	79
46	Srijut K. C. Sharma, Entomological Assistant ...	146
47	Babu F. S. Datta, Botanical Assistant	46
48	Babu P. M. Ganguli, Botanical Assistant ...	7
49	Babu B. K. Dhar, Botanical Assistant	4
50	Babu B. N. Bhattacharyya, Jute Inspector ...	117
51	Babu B. K. Das, Agricultural Inspector, Livestock	63
52	Babu J. C. Chakravorty, Agricultural Inspector, Livestock.	50
53	Mr. T. Ahmed, Agricultural Inspector, Livestock	169
54	Babu D. L. Pal, Agricultural Inspector, Livestock	169
55	Maulavi T. R. Hazarika, Agricultural Inspector, Livestock.	152
56	Srijut D. C. Barua, Agricultural Inspector, Livestock.	78
57	Babu T. R. Sen, Agricultural Inspector, Livestock	41

APPENDIX VIII A

Statement showing the Receipts and Expenditure of the Department of Agriculture, Assam, for the year ending 31st March 1940

Receipts: Heads	Receipts: Amounts	Expenditure: Heads	Expenditure: Amounts
	Rs. a. p.		Rs. a. p.
I. Sale of manure and farm produce.	27,729 0 0	1. Superintendence—	
		(*a*) Non-excluded area	1,58,488 0 0
		(*b*) Excluded area ..	7,418 0 0
II. Receipts from Seed Depots.	16,752 0 0	2. Experimental farms (excluding Sugarcane Research Station, Deep Water Paddy Farm and Citrus Fruit Station).	75,530 0 0
III. Other Receipts ..	13,768 0 0	3. Cattle Breeding charges.	65,249 0 0
		4. Expert Staff ..	54,133 0 0
		5. Agricultural Education.	13,035 0 0
		6. Agricultural Demonstration and Propaganda (excluding Jute Propaganda.)	63,588 0 0
		7. Seed Depots (after deduction of Rs.20,771 for recovery).	11,701 0 0
		8. Rural Uplift Scheme	20,290 0 0
		9. Botanical and Public Gardens (including Shillong Station Nursery).	3,654 0 0
		10. Works	27,086 0 0
Total Receipt ..	58,249 0 0	Total Expenditure ..	5,00,172 0 0

APPENDIX VIII B

Pro forma *Account of Receipts and Expenditure on account of the working of 17 irrigation pumping sets during the year ending 31st March 1940*

Particulars	Amount	Particulars	Amount
	Rs. a. p.		Rs. a. p.
Recovery of working expenses.	3,921 0 0	Expenditure during the year.	14,816 0 0

APPENDIX IX

PROGRAMME OF WORK OF THE DEPARTMENT FOR THE YEAR 1940-41

A.—General (Demonstration, Propaganda, Education, etc.)

I.—Surma Valley

The activities of this Circle will include, among other items of work, the following :—

1. Demonstration and distribution of recommended types of aus, sail, asra, amon and boro paddies.
2. Introduction and distribution of kharif and rabi crops, such as, potato, oilseeds, chillies, pulses and other crops, such as, onion, turmeric and ginger.
3. Extension of the area under the more common fruit trees, *viz.*, banana, pineapple, litchi, lime, papaya and cocoanut, and pulses and pepper.
4. Extension of the area under improved types of sugarcane by means of distribution of setts on the return system.
5. Issue of recommended paddy and other seeds to selected cultivators for multiplication.
6. Manurial trials on selected money crops during the rabi season.
7. Demonstration on the preparation of compost manure. The utilisation of water hyacinth as compost will also be demonstrated.
8. Eradication of water hyacinth.
9. Propaganda for the extensive use of covered manure pits.
10. Demonstration on irrigation by hand and bullock power pumps for vegetable gardening.
11. Cultivation of boro baddy on precarious amon areas under irrigation by means of power pumps.
12. Demonstration of improved implements.
13. Improvement of paddy land by small bunds and canals.
14. Survey of the area under jute and jute development work by the Indian Central Jute Committee.
15. School Gerdening.
16. Demonstration of vegetable gardening and seed raising in the Malugram Plot near Silchar.
17. Development of demonstration plots and nurseries in 15 Rural Reconstruction Centres.
18. Training of unemployed youths at the Agricultural Training Class at Sylhet.
19. Agricultural propaganda with magic lanterns, leaflets and by participating in exhibitions.
20. Development of a small agricultural nursery at the Deputy Director's headquarters at Sylhet.

21. Survey of pan tracts in the Surma Valley.
22. Control of pan diseases by spraying and soil sterilization, introduction of improved cultural practices and manuring.
23. Campaign against rice swarming caterpillar in the Jaintia Parganas.
24. Control of rice stem borers by light traps, rice bugs by bagging and rice case worm by netting in the insect campaign centres of the Jaintia Parganas.
25. Control of different insect pests.
26. Rearing of insect pests, including a systematic collection of insects at the Entomological Laboratory at Sylhet.
27. Development of the apiary at Jaintiapur, including the introduction of bee-keeping in suitable areas.
28. Development of agricultural associations in suitable localities.

II.—Upper Assam Valley

Work in this Circle will be continued on previous lines and will include, among other activities, the following :—

1. Distribution of recommended seeds, manures, etc.
2. Development of backward areas.
3. Demonstration of systematic rotation of crops and continuous cropping for intensive farming.
4. Introduction of collective farming in selected areas.
5. Introduction of boro paddy cultivation by means of power driven pumps and Dongs in suitable localities.
6. Extensive demonstration of improved methods of gur production and preservation.
7. Extension of bee-keeping.
8. Encouragement to farming by middle class unemployed youths.
9. Training of unemployed middle class youths at the Agricultural Training Class at Jorhat.
10. Jute development work.
11. Rural Reconstruction Campaign.

III.—*Lower Assam Valley*

The activities of this circle will be carried on on former lines with some alterations and will include, among other work, the following :—

1. Introduction of recommended types of sugarcane.
2. Introduction of improved varieties of paddy.
3. Conservation of cattle manure.
4. Introduction of sunnhemp as a green manuring crop.
5. Rotation of crops.
6. Introduction of improved gur making furnaces.
7. Demonstrations with improved agricultural implements.
8. Cultivation of boro paddy by means of power driven irrigation pumps.
9. Multiplication of improved seeds.
10. Propaganda by means of lantern lectures, shows, etc.
11. Development work on jute.
12. School Gardening.
13. Rural Reconstruction Campaign.

IV.—*Hills*

Work in the Hills will be continued on previous lines and steps will be taken for the extension of terraced rice cultivation, improvement of jhuming, prevention of soil erosion and introduction of new crops.

B.—LIVESTOCK SECTION

The work of the Livestock Section wil be continued on previous lines and will include the following :—

1. *The Upper Shillong Experimental Farm*—Breeding of livestock, namely, cattle, sheep, ponies and poultry ; growing of fodder crops ; cultivation of potato, maize, soybean and local millets. The aim and object remain the same.

2. *The Khanapara Cattle Breeding Farm* —The policy of the previous year will be continued, that is, breeding Scinde × Assamese grade cattle and issue of bulls, goats and poultry ; growing of fodder crops. Money crops, such as, vegetables, plaintains, etc, will be taken up. The farm will henceforth work on the line of a mixed farm.

3. *The Sylhet Cattle Breeding Farm*—The same policy will be continued, that is, breeding of Scinde and Scinde × local grade cattle ; growing of fodder crops will be done. This farm henceforth is to specialise in milk production and dairying and also to commence goat breeding.

4. *The Jorhat Farm*—Breeding of Jorhat grey type of general purpose cattle and issue of bulls ; maintaining a flock of poultry for breeding and issue. Growing of fodder crops.

5. Continuation of the maintenance and supervision of breeding bulls in villages under the five Agricultural Inspectors, Livestock, the group system being adhered to, as in the previous year. Transfer of the Rural Uplift Bull Scheme, financed by the India Government, to the Provincial Government.

6. Cotinuation of control in the Notified Grazing Reserves and the notification of new reserves where possible. The old policy of improving breeds will be continued. Purchase of young bulls from Notified Reserves for village groups.

7. Continuation of supervision of the milk union at Gauhati.

8. Continuation of demonstration of fodder gardens and silage making in village groups. Trial and distribution of Para, Jhora, Kikuyu, Paspalum and aquatic grasses.

9. Distribution of goats and poultry in selected villages. Duck breeding at the Pukra grass plot.

10. Continuation of the work of the Livestock Improvement Association of Assam and its Subdivisional Branches as far as funds permit.

11. Propaganda by lantern lectures and shows.

C. RESEARCH SECTION

1.—PADDY

(*i*) *Karimganj Paddy Experiment Station.*

A. Pure—Line selection.

(*a*) *Aus*—

(*i*) Early *aus* (Dumai).

Ordinary—25 }
Selected— 10 } 35

(*ii*) Medium *aus* (Murali and Chengri).

Ordinary—71 }
Selected —20 } 91

(*iii*) Transplanted *aus*—

Ordinary—120 }
Selected — 25 } 145

(*b*) *Sail*—

Ordinary—502 }
Selected — 55 } 557

(*c*) *Birain*—

Ordinary—57

(*d*) *Asra.*—

Ordinary—105 }
Selected—33 } 138

(*e*) Aman—12

1035

B. *Cross breeding*—

(*a*) *Aus* cross— F_2 —300
F_6 — 42
F_7 — 82
$F_{8\text{-}13}$— 85

(*b*) *Sail* cross— F_1 — 41
F_2 —850
F_3 —250
F_4 — 28
$F_{6\text{-}19}$—197

(*c*) *Birain* cross— F_{12} — 5

(*d*) *Asra* Cross— F_2 —200
$F_{10\text{-}14}$— 29

2109

C. *Preliminary varietal trial.*—(*a*) Dumai, Murali and Chengri (including hybrids).

Varieties—(1) D. 138-6 (standard), (2) D. 200, (3) M. 36-30, (4) M.207-2, (5) M.210-1, (6) M.210-2, (7) M.210-3, (8) M.210-4, (9) As.C.777-21 c, (10) As.C.1036-33, (11) As.C.1285-66 b, (12) As.C.1285-81 a.

Arrangement—Randomised blocks.

Replications—Four.

(*b*) Transplanted aus (including hybrids).

Varieties—(1) As.2, (2) As.102-1, (3) As.104-4, (4) As.105, (5) As. 108-2, (6) As.138-1, (7) As.143, (8) As.C.501-122 b, (9) As.C.503-100, (10) As.C.536-14, (11) As.C.536-140, (12) As.C.536-176, (13) As.C.777-7, (14) As.C.777-82 b, (15) As.C.777-105 b-1, (16) As.C.869-140.

Arrangement—Two dimensional pseudo-factorial with two groups of sets.

Replications—Four.

(*c*) *Sail* (including hybrids).

Varieties—(1) S.C.94-47 (standard), (2) S.581, (3) S.159, (4) S.C. 412-132, (5) S.C.638-2, (6) S.C.638-3, (7) S.C.638-57, (8) S.C.671-4, (9) S.C.671-5, (10) S.C.1177-6, (11) S.C.1177-31, (12) S.C.1177-16, (13) S.C.1177-26, (14) S.C.1177-32, (15) S.C.1177-34, (16) S.C.1177-37, (17) S.C.1177-43, (18) S.C.1177-61, (19) S.C.1384-66, (20) S.C.1384-73, (21) S.652-1, (22) S.414, (23) S.C.638-69, (24) S.C.1177-36, (25) S.C. 1177-59.

Arrangement—Two dimensional pseudo-factorial with two groups of sets.

Replications Four.

(*d*) *Asra* (including hybrids).

Varieties—(1) Ar.1 (standard), (2) Ar.13, (3) Ar.123-1, (4) Ar.127, (5) Ar.134-2, (6) Ar.139, (7) Ar.C.614-43, (8) Ar.C.615-28 a, (9) Ar.C.615-28 b, (10) Ar.C.615-44.

Arrangement—Randomised blocks. Replications—Four.

D. *Final varietal trials* (including hybrids.—(*a*) Transplanted aus.

Varieties—(1) As.2 (Kasalath), (2) As.85, (Kasalath) (3) As.93-2, (Kasalath), (4) As.101-2 (Aus Dudbat), (5) As.144 (Dhali aus), (6) As.C. 536-51 (hybrids).

Arrangement—Latin square (6 × 6). Size of plots 9′ × 9′.

(*b*) *Sail* (hybrids).

Varieties—(1) S.C.94-47 (standard), (2) S.C.54-56, (3) S.C.40-34, (4) S.C.1177-36, (5) S.C.1177-37, (6) S.C.1177-61.

Arrangement—Randomised blocks. Replications—Six.

Size of plots—64.5′ × 9.75′

(*c*) *Asra*—

Varieties—(1) Ar.1, (2) Ar.123-3, (3) Ar.142, (4) Ar.C.615-19 a, (5) Ar.C.615-33 a.

Arrangement—Latin square (5 × 5).

Size of plots—18′ × 18′.

E. *Recommended types* Vs. *Local types*.—(*a*) Early and medium *aus*—

Varieties—(1) D.138-6, (2) M.36-30, (3) M.142, (4) C.148-1, (5) M. 175-1, (6) Local.

Arrangement—Latin square (6 × 6).

Size of plots—9′ × 9′.

(*b*) Transplanted *aus*—

Varieties—(1) As.2, (2) As.3, (3) As.24-1, (4) As.46, (5) As.C.536-143 (hybrids), (6) Local.

Arrangement—Latin square (6 × 6).

Size of plots—9′ × 9′.

(*c*) *Sail*.

Varieties—(1) S.22 (lati sail), (2) S.61 (Prosadbhog), (3) S.155 (Badshabhog), (4) S.156 (Nagra sail), (5) S.161 (Dhepi sail), (6) S.C.54-60 (Vijoy sail), (7) S.C.94-47 (Kerr sail), (8) S.C.671-16 (hybrid), (9) Local.

Arrangement—Randomised blocks.

Replications—6

Size of plots—9′ × 9′

(*d*) *Asra*.

Varieties—(1) As.1, (2) Ar.2, (3) Ar.108-1, (4) Ar.C.353-148 (hybrid), (5) Local.

Arrangement—Latin square (5 × 5).

Size of plots—18′ × 18′.

F. *Cultural experiments*.—(*a*) Best age of seedlings in Aus (2 factors).

Varieties—(1) As.2, (2) As.3.

Ages of seedlings—(1) 10 days, (2) 20 days, (3) 30 days, (4) 40 days.

Replications—4.

Size of plots—31′ × 65′.

(*b*) Best space of seedlings in Aus (2 factors).

Varieties—(1) As.2, (2) As.3, (3) As.24-1, (4) As.46, (5) As.C.536-143 (hybrid), (6) Local.

Spacing—(1) 3 inches, (2) 4 inches, (3) 6 inches.

Number of seedlings in all cases 2.

Replications—4. Size of plots—9′ × 9′.

(*c*) *Sail*—A complex experiment in *sail* with 3 factors.

Time of planting—(1) 15th June, (2) 5th July, (3) 25th July, (4) 5th August.

Ages of seedlings—(1) 20 days, (2) 30 days, (3) 40 days, (4) 50 days.

Number of seedlings—(1) 2 seedlings, (2) 4 seedlings, (3) 6 seedlings.

Varieties—Lati sail. Replication—4.

Size of plots—30·75′ × 9·75′.

(*d*) Optimum number of ploughings required for *sail*.—

Ploughings—(1) 4 ploughings, (2) 6 ploughings, (3) 8 ploughings. (4) 10 ploughings, (5) 12 ploughings.

Replications—Four. Size of plots—66′ × 14·5′.

(*e*) Late transplanting in sail.

Varieties—(1) Vijoy sail, (2) Lati sail, (3) Kerr sail, (4) Badshabhog, (5) Prasadbhog.

Arrangement—Latin square (5×5).

Size of plots—$6' \times 9{\cdot}75'$.

G. *Genetical studies*—(*a*) F1—(*i*) S.658 × S.454—Inheritance of the length of panicle in Sail.

(*i*) S.22 × S.156—Inheritance of the size of grains in Sail.

(*b*)F2—(*i*) As.24—1—Inheritance of the size of grains in *aus*.

(*ii*) As.2 × As 125—Inheritance of the height of plants in *aus*.

(*iii*) S.603 × S.670—Inheritance of the white striped and fully coloured (purple) characters in Sail.

(*iv*) S.22 × S.670—Inheritance of green and fully coloured characters in Sail.

(*v*) S.565 × Wild paddy; S.C. $\frac{54}{60}$ × Wild paddy } Inheritance of the wild character in Sail.

(*vi*) Ar.C. $\frac{253}{148}$ × Ar. $\frac{108}{1}$—Evolution of a high yielding early type in Asra.

(*c*) F —(*i*) S. $\frac{442}{1}$ × S.603—Inheritance of the white stripped and coloured characters in Sail.

(*ii*) S. 22 × S. $\frac{353}{2}$—Inheritance of the colour of apiculus and stigma in Sail.

(*iii*) S. $\frac{158}{2}$ × S. $\frac{158}{3}$—Inheritance of the colour of apiculus and stigma in Sail.

(*iv*) S.453 × S.455—Inheritance of the colour of awns in Sail.

(*v*) S.22 × S. $\frac{227}{1}$—Inheritance of the aroma in rice with special reference to the size of grains.

Miscellaneous experiments.—

(*a*) Seed testing.

(*b*) Study of the insect and disease resistant varieties.

(*c*) Milling test.

(*d*) Cooking test.

(ii) *Titabar Paddy Experiment Station*

1. Pure line selection.—

(a) *Ahu*—Observation.

(i) Selected group—40 types.
Size of plots—$6\frac{1}{2}' \times 6\frac{1}{2}'$
Interspace—2′.

(ii) Ordinary group—140 types.
Size of plots—$4' \times 4'$
Interspace—$2\frac{1}{2}'$

(b) *Sali*—Observation.

(i) Selected group—100 types.
Size of plots—$9\frac{3}{4}' \times 9\frac{3}{4}'$
Interspace—$3\frac{1}{2}'$
Area— .4 acre.

(ii) Ordinary group—645 types.
Size of plots—$3\frac{3}{4}' \times 3\frac{3}{4}'$
Area— .5 acre.

(iii) Newly collected group—111 types.
Size of plots—$9\frac{1}{4}' \times 6'$
Interspace—2′
Area— .3 acre.

2. Cross-breeding.—

(a) *Ahu*—Some new crosses to be tried.
F_2—200 plants.
F_4—25 types.
F_5—23 types.
F_6—25 types.
F_9—11 types.

(b) *Sali*—Some new crosses to be tried.
F_1—93 plants.
F_4—23 types.
F_5—25 types.
F_6—20 types.
F_7—12 types.
F_{8-14}=13 types.

3. Pseudo factorial trial.—

(*a*) *Ahu*—

Varieties—49 types.
Replications—4 times.
Size of sub-plots—7′ × 7′
Interspace—2½′
Area—·4 acre.

(*b*) *Sali*—

Varieties—49.
Replications—4 times.
Size of sub-plots—8¼′ × 8¼′
Interspace—1¼′
Area—·4 acre.

4. Preliminary varietal trial.

(*a*) *Ahu*—

Varieties—12 (As.35, As. 25, As.86, As.29, As.20/1, As.48, As.175-1, As.180-1, As.92-1, As.131, As.81-1, As.140.)

Arrangements—3 Randomised blocks.

Size of sub-plots—9′ × 9′

Interspace—2′

Area—·1 acre.

(*b*) Trial of early Ahu types.—

Varieties—12 (As.20-1, As 24, As.31, As.57-1, As.59-4, As.62, As.86, As.93-1, As.131, As.140, As. 148, As.207.)

Arrangements—4 Randomised blocks.

Size of sub-plots—9′ × 9′

Area—·1 acre.

(*c*) Sali preliminary varietal trial—

Varieties—12 (S. 155, S. 180, S.C. 308/210, S.C. 308-372 S.C.308/51, S.C.308/206, 308/473-2, S.140 S./L.202, S.816/1, S.507 and Daudkhani.)

Arrangements—3 Randomised blocks.
Size of sub-plots—9′ × 9′
Interspace—2′
Area—·1 acre.

5. Final varietal trial.—

(*a*) *Ahu*—

Varieties—6 (As.11/2, As.20/1, As.29, As.48, As.86, As.313/11.)

Arrangements—6 Randomised blocks.

Size of sub-plots—31′×9′

Interspace—2′

Area—·3 acre.

(*b*) *Sali*—

Varieties—6 [$\frac{S.}{L.}$ 70(*a*), S.115, $\frac{S.}{J.}$ 311, $\frac{S.}{L.}$ 533, S.C.308/51, and S.C.308/210.]

Arrangements—6 Randomised blocks.

Size of sub-plots—6′×9′

Interspace—2′

Area—·6 acre.

6. Trial of recommended *versus* Local types.

Varieties—12 (S.115, S.126, S./J.311, S./L.533, S/L.240, S/L.70 (*a*), S.751, S.754, S.772, S.C.308-372, Mathanga and Kolasali.)

Arrangements—3 Randomised blocks.

Size of sub-plots—9′×9′

Area—·1 acre.

7. Confounding cultural experiments with 3 factors in Sali (to be repeated.)

Variety—1 Prasadbhog.

Spacing—3 (6″—9″—12″)

Number of seedlings per hole—3 (One seedling, 2 seedlings, 3 seedlings.)

Age of seedlings—3 (30 days, 45 days, and 60 days.)

Arrangements—4 Randomised blocks.

Size of sub-plots—66′×6′ (1/110 acre.)

Area—1·2 acres.

8. (*a*) *Ahu*—

Cultural experiment with 2 factors (new).

Variety— 1 *Rangadaria.*

Spacings—3 (3″—4½″—6″).

No. of seedlings—2 (2 and 4 seedlings per hole).

Size of sub-plots—15′ × 9′

Replications—4 times, in randomised blocks.

Area—·1 acre.

(*b*) *Sali*—

Varieties—3 [Ahom *sali* (early), *Latamaguri* (medium), and Bengali *Joha* (late).]

Spacings—3 (4″—6″—9″).

Number of seedlings—3 (2 and 4— seedlings per hole).

Arrangements—Randomised blocks.

Replications—4 times.

Size of sub-plots—6′ × 32′

Area—·6 acres.

9. Water requirement in *sali* paddy with 2 factors—

Varieties—[Ahom *sali* (early), and Bengali *joha* (late)].

Treatments—4 (0″—3″—6″—9″).

Arrangements—Randomised blocks.

Replications—3 times.

Size of sub-plots—14½′ × 31′

Area—·4 acre.

10. Effect of weak *Vs.* strong seedlings.

Varietiey—1 *Prasadbhog.*

Treatments—4 (4—6—8 and 10 maunds of seed per acre).

Arrangements—Randomised blocks.

Replicated—4 times.

Size of sub-plots—15′ × 32′

Area—·2 acre.

11. Maturity test—

Varieties—5 (S. 126, S. 115, S/J.311, S/J.226 and S/J.835/1).

Treatments—4 (4—5—6 and 7 weeks after flowering.)

Replications—3 times in randomised blocks.

Size of sub-plots—12′ × 32′

Ar ea—·6 acre.

12. Late transplanting in *sali*—

Varieties—6 (*Vijoysali, Latisali, Laudumra, Latamaguri, Bengalijoha* and *Badshabhog*).

Replications—4 times in randomised blocks.

Spacings—2 (4″ and 6″) (to be planted on 10 to 15th September).

Size of sub-plots—9′ × 20′

Planting—4 seedlings per hole.

Area—·2 acre.

13. Top cutting experiment—

Varieties—2 [S. 115 *Latamaguri* (*sali*), *Dhalabadal* (*Asra*).]

Treatment—3 (0—1 and 2 cuttings).

Arrangements—Randomised blocks.

Replicated—6 times.

Size of sub-plots—30′ × 15′

14. Deep *Vs.* Shallow ploughing in *sali*—

Variety—1 *Prasadhog.*

Treatments—2 { 1—Deep ploughing—9″
1 Shallow ,, —3″ }

Arrangements—Randomised blocks.

Size of Sub-plots—15′ × 66′

Area—·2 acre.

15. Genetical studies—

(*a*) F1—(1) Inheritance of earliness and height in *sali.*

(2) ,, ,, the number of tillers in *sali.*

(3) ,, ,, ,, ,, ,, grains ,, ,,

(4) ,, hybrid vigour in *sali* and *Asra.*

(*b*) F2—(1) Inheritance of earliness, colour of kernel and of colour of inner glume in *ahu.*

16. Miscellaneous experiments—

(*a*) Study of qualitative and quantitative characters of 90 varieties of *ahu* and 150 varieties of *sali.*

(*b*) Seed testing

(*c*) Sterility in rice.

(*d*) Milling quality of rice.

(*e*) Study of insect pests and fungus diseases.

(*f*) Trial of *Asra* in lower level.

(*iii*) *Deep Water Paddy Research Farm, Habiganj*

1. Isolation of pure lines in *Aman* and *Boro.*

2. Description of the characters of the fixed types on the lines suggested by the Rice Sub-Committee.

3. Varietal trials will be repeated with the same layout to assess the influence of season. Two final trials will be included in *Laki* and *Lal Aman* groups of the *Aman* paddy.

4. Cultural experiments will be continued with the same layout to study the influence of season.—

The following two new experiments will be added :—(*a*) Summer *Vs.* Winter ploughings in *Aman.*

(*b*) Optimum number of ploughings required for Aman under both (*i*) dry and (*ii*) wet conditions.

5. Analysis of the serial experiments in *Aman* and *Boro.*

6. Submergence studies in *Aman* will be continued on the same line as before for one year more. A replicated submersion experiment for comparing the promising types will be taken up next. (An improvised structure has been erected to conduct the experiment more efficiently).

7. Correlation studies in the selected *Boro* types.

8. Border-line effect in *Boro.*

9. Manurial experiment in *Boro* with water hyacinth.

10. Genetical studies on the crosses between *Sail* and *Boro* in the F1 generation and the inheritance of kernal size in a *Boro* cross. Some new crosses will be tried between the different groups of *Boro* paddy.

11. Selection of homozygous types with special reference to quality and yield from the crosses between *Aus* and *Boro.*

II. SUGARCANE

Sugarcane Research Section of the Jorhat Farm

(A) *Varietal Studies*

1. Study of 11 new varieties of Coimbatore canes in the nursery plots.

2. Preliminary studies of 38 varieties of cane including the standard variety Poj.2714 in the observation plots.

(B) *Experiments with Plant Canes*

1. A 3^3 manurial experiment to study the interactions of three factors. Nitrogen, Phosphate and Potash at 3 levels each, in confounded design with partial confounding of some 2nd order interactions with 3 complete replications.

2. Manurial experiment with organic manures (3 levels) and inorganic manures (3 levels) and their combinations, consisting of seven treatments replicated 5 times in randomised blocks.

3. Final varietal experiment with normal ripening canes, *viz.* (1)Co.408 (2) Co.413, (3) Co.419, (4) CoJ1 and (5) Poj 2714 (standard) in 5×5 Latin square.

4. Final varietal experiment with medium ripening canes, *viz.*, (1) Co. 355, (2) Co. 356, (3) Co. 418, (4) Co.421 and (5) Co.290 (standard) in 5×5 Latin squares.

5. Semi-final varietal experiment with (1) Co. 436, (2) Co. 439, (3) Poj. 2272×Co.290—Type 3, (4) Poj. 2878×Co. 290—Type 4, (5) Poj. 2878 ×Co. 290—Type 15, (6) Co. 331, (7) Co.435, and Poj. 2714 (standard) replicated 3 times in randomised blocks.

6. Green manuring experiment to find the effect of different green manures, *viz.*, (1) Cowpea, (2) Dhaincha, (3) Sunnhemp and (4) Control on sugarcane replicated 5 times in randomised blocks.

(C). *Experiments with Ratoon Canes*

1. The 3^3 manurial experiment to study the interaction of three factors nitrogen, phosphate and potash at 3 levels each, conducted with plant cane, last year, will be continued in ratoon canes to test the residual effect of manures.

2. The manurial experiment with organic manures (3 levels) and inorganic manures (3 levels) and their combinations, conducted with plant canes last year, will be continued in ratoon canes to test the residual effect of manures.

3. *Final varietal experiment*—Normal ripening group with 5 varieties conducted with plant canes last year, will be continued to test ratooning capaciry.

4. *Final varietal experiment*—Medium ripening group with 5 varietiess conducted with plant canes last year, will be continued to test ratooning capacity.

5. Semi-final varietal experiment with 8 varieties, conducted with plant canes last year, will be continued to test ratoon capacity.

6. The green manurial experiment with different green manures, conducted with plant canes last year, will be continued to test the residual effect of green manures.

III.—POTATO

Upper Shillong Experimental Farm

1. Growing of potato in field scale for production of seed from the following varieties :—

Talisman '39, Factor '39, Up-to-date '36, Inverness Favourite '36, Darjeeling '38, Laitlyngkot Pink '38, Arran Banner '37, Italian White Round '36, Arran Consul '36, Ben Cruachan '40, King Edward '40, Great Scott '27.

2. Manurial experiment on potato with (*i*) bonemeal, cowdung, compost and oilcake and (*ii*) sunflower and Rymbai-ja (*matikalai*) as green manuring crops.

3. Trials on methods of planting, *viz*., (*i*) shallow planting *versus* deep planting and (*ii*) planting potato closer than the usual distance.

4. Observation on storage, *viz*, (*i*) greening for shortening the period of dormancy to effect early sprouting for seed to be supplied to the plains, (*ii*) treating of seeds with corrosive sublimate for prevention of infection with Scab and Bacterial rot and (*iii*) storing with manipulation of light and air.

IV.—FRUITS

(*i*) *Fruit Experiment Station, Shillong*

1. Nursery operations (raising of various fruit stocks for budding and grafting).

2. Care of the growing trees :—

(*a*) Manuring of about 1/3rd of the garden under cultivation.

(*b*) Prunning of trees.

(*c*) General spraying of all trees with Bordeaux mixture against fungus pest. " Black leaf 40 " (Nicotine sulphate) is to be used against Wooly aphis in apple trees.

(*d*) Top working of unprofitable trees.

3. Filling up the gaps in the garden.

4. Observation of a few drug plants (Pyrethrum, Gaultheria, Digitalis, Chirata and Cinchona).

5. Up keep of bee-colonies.

6. Making of jam, jelly, marmalade, etc.

7. Canning of fruits.

8. Study of major insect pests and diseases.

9. Miscellaneous—(*a*) Preparation of leaf mold in pits.

(*b*) Stock trial with wild apple and pear.

(*c*) Harvesting and selling fruits and grafts.

(*d*) Light hoeing the bases of trees and covering them with dry weed mulch.

(*ii*) *Citrus Fruit Experiment Station, Burnihat.*

General—Reclamation of the newly acquired land will continue.

Technical—

Item I.—To be continued as before.

Item II.—(*a*) Planting of 3 seedlings of different varieties in the variety block for identification and classification.

(*b*) Budding on all the varieties of stocks raised in the station and planting three budded plants of each variety for observation.

(*c*) Budding on 5 different stocks collected for the indigenous stock trial experiment will be taken up.

(*d*) Budding on 5 different root stocks for the co-operative stock trial experiment will be carried out.

Item III.—(*a*) Yield of individual trees will be recorded.

(*b*) Planting will be done if uniform seedlings of requisite height are available.

Item IV.—Yield of individual trees will be recorded.

Item V.—Observations on insect pests and diseases will continue.

Item VI.—To start work in packing and picking in co-operation with the Marketing Section will begin.

V.—BOTANICAL WORK AT THE JORHAT FARM

Cotton

1. Acclimatization of long staple cotton obtained from different provinces of India.

2. Selection and cross breeding work on cotton.

3. To study the effect of colchicine for the production of allopolyploids.

Tobacco

1. Acclimatization of cigarette tobacco.

2. Genetical studies of—(*a*) Number and size of leaves.

(*b*) Texture of leaves.

Potato

1. Selection of types.
2. Experiments on resting period and storage.

Sesamum

1. Selection of types.
2. Time and method of sowing.

Soybean

1. Selection of types for grain and fodder.
2. Analysis of oil contents.

Linseed

1. Pure line selection.
2. Final varietal trial—Varieties—6
   Replications—6
   Arrangement—Randomised blocks.
   Size of plots—30′ × 16′

Groundnut

1. Varietal trial (Imperial Council of Agricultural Research Scheme).
   Varieties—7
   Arrangement—Latin square (7 × 7).
   Size of plots—48′ × 13′

Jute

1. Varietal trial—Varieties—6
   Arrangement—Randomised blocks.
   Replications—4
   Size of plots—45′ × 12′
2. Retting experiments.

Miscellaneous Crops

1. Observation will be made on the following crops—

(*a*) Arhar, (*b*) Maize, (*c*) Rhea, (*d*) Mestapat, (*e*) Perfume yielding plants, (*f*) Medicinal plants, (*g*) Berseme, (*h*) Oat, (*i*) Niger, (*j*) Fodder grass.

VI.—AGRICULTURAL CHEMISTRY

1. Analysis of sugarcane juice in plant and ratoon canes including work under Sugarcane Research at the Jorhat Farm.

   (*a*) Periodical analysis of juice from selected varieties of cane.
   (*b*) Varietal experiments—final and semi-final.
   (*c*) Manurial experiments.
   (*d*) Cultural experiments.
   (*e*) New varieties of cane.
   (*f*) Canes from selected outside localities.

(2) Conduction of (1) Varietal, (2) Manurial and (3) Cultural experiments, with Statistical analysis of results under Sugarcane Research at the Jorhat Farm as per programme of the Sugarcane Research Scheme.

3. Periodical estimation of bagasse in a few selected varieties of sugarcane.

4. Manurial experiments on rice at—

(a) Karimganj Farm.

(b) Titabar Farm.

5. Manurial experiments on potato at the Upper Shillong Farm.

6. Special manurial demonstrations on sugarcane in a few selected localities.

7. Analysis of soils (mechanical and chemical).

(a) Government farms.

(b) Soils from selected sugarcane and orange growing tracts.

(c) Other samples as sent by the Deputy Directors and private individuals.

8. Testing of a new and rapid method of soil analysis.

9. Analysis of manures and fertilisers.

10. Analysis of feeding stuff and grasses, etc.

11. General routine work of the Laboratory including miscellaneous analysis.

VII.—ENTOMOLOGY

1. Control of sugarcane borer pests to be continued in the farm and the measures to be demonstrated in cultivators' fields.

2. To find out and to recommend suitable control measures against mustard beetle pests.

3. A winter survey of the early breeding grounds of paddy hispa and a regular campaign against the pest as in the last year to be taken up as early as posible.

4. Control of other major paddy pests to be demonstrated.

5. Control of (1) Cirtus trunk borere, (2) Cirtus green bug and (3) Lemon caterpillars to be systematically taken up in the growers' fields.

6. Control of swarming caterpillars in Matikalai and Mung cultivations to be taken up in Nowgong and some districts of the Lower Assam Valley.

7. The problem of extensive Army worm damage to paddy in Goalpara district to be tackled.

8. Bee-keeping to be attended to as usual. To open a few centres in suitable localities by supplying boxes and colonies if necessary.

9. To take up theoretical and practical classes with the students of the Agricultural Training Class.

10. To adopt systematic work against Rhinoceros beetles in the Lower Assam Valley.

VIII.—MYCOLOGY

1. Observation of fungus diseases in general field crops, fruits and vegetables in both the valleys and suggestion of control measures.

2. Experimental :—

(*a*) Control of the diseases of potato wherever required and specially in Sibsagar district.

(*b*) Study of a few varieties of potato at Kakilamukh to find out their individual resistive character against the common diseases that are noticed there.

(*c*) Varietal study of tomato to find out a variety resistant against wilt disease.

(*d*) Periodical sowing of tomato seeds to find out the proper time that will help against wilt disease.

(*e*) Control of the diseases of sugarcane at the Jorhat Farm.

(*f*) Observation and control of the diseases of sugarcane in the cultivators' plots and comparison with our farm crop.

(*g*) Treatment of yellow orange trees in cultivators' plots by different methods to see the result.

(*h*) Study of the diseases of tobacco in different varieties specially with reference to leaf curl disease.

(*i*) Study of the diseases of jute with special reference to Diplodia Corchori which is reported to cause serious damage in both the valleys.

(*j*) Control of foot rot disease of pan (in old vines that are trained on tall trees) and orange by Cargilineum mixture in Upper Assam Valley.

(*k*) Study and control of diseases of vegetable crops at Jhanji and Kakilamukh.

(*l*) Study and control of diseases of Rabi crops at Kakilamukh.

3. District work in co-operation with the district staff :—

(*a*) Control of the diseases of cultivated crops as necessity arises.

(*b*) Control of wilt disease of pan at Dibrugarh and in other suitable centres in Upper Assam Valley.

(*c*) Observation of diseases of pan in the Surma Valley during rainy season.

(*d*) Control of the diseases of banana and sugarcane at Dibrugarh.

(*e*) Observation on Orobanche as a parasite on tobacco.

4. Training of the students of the training class of both the valleys.

5. Laboratory routine work.

IX.—AGRICULTURAL MARKETING SURVEY

1. Marketing survey of jute in Assam.
2. Marketing survey of cotton in hill districts of Assam.
3. Grading of mustard oil at Jorhat and Gauhati.
4. Grading of oranges at Gauhati and Sylhet.
5. Grading of eggs in Habiganj subdivision.
6. Propaganda for introduction and publicity for "Agmark" products such as, ghee, edible oils, oranges, etc.
7. Inspection and registration of dealers in "Agmark" ghee in important centres.
8. Organisation of co-operative jute grading stations.
9. Marketing of Assam pineapples and oranges in Calcutta.
10. Demonstration on picking and packing of pineaples and oranges in improved crates.
11. Propaganda by distribution of leaflet on picking and packing of pineapples and hand bills on marketing of Assam pineapples and oranges in the consuming centres.
12. Organisation of association of pineapple growers at Tezpur and Barpathar.
13. Registration of the names of important dealers in different centres to dispose of different crops whenever required.
14. Market news-service. Collection of weekly market prices of different commodities of the selected key markets—Calcutta, Jorhat, Gauhati, Tinsukia and Sylhet.
15. Collection of monthly market prices of the district and subdivisional towns in Assam.
16. Collection of monthly export and import figure of different commodities from Sylhet, Gauhati, Jorhat and Tinsukia stations.
17. Rendering suggestions to Railway, Steamer and other transport agencies for improvement of transport facilities.
18. Rendering help to the producers and exporters by obtaining concessional rates in freight.
19. Improvement of trade in live animals, production of hides and skins, eggs, table poultry, etc.
20. Preparation of the draft of the Agricultural Produce Markets Bill.
21. Preparation of the draft of the Standard Weights and Measures Bill.

GLOSSARY

Aman or Bao	Broadcast deep water winter rice.
Arail	Homalocenchrus hexandrus Kuntze.
Asra	Shallow water winter rice.
Aus or Ahu	Summer and Autumn rice.
Baman Badhua, Howa durba ...	Pseudoraphis brunoniana Griff.
Birain, Bora	Glutinous rice.
Chisra or Piyaji	Eleocharis Plantaglinea R. Br.
Cow pea	Vigna catiang Walp.
Dhaincha	Sesbania aculeata Pert.
Doob	Cynodon dactylon Pers and Sporobolus tremulus Kunth.
Dudhchalia	Hemarthria protensa Steud.
Field peas	Pisum arvense Linn.
Garden peas	Pisum sativum Linn.
Ghoraghaie	Vossia cuspidata Griff.
Guinea grass	Panicum jumentorum or maximum.
Howa and Parua	Echinochloa stagnina Beauv.
Ikra	Saccharum ravennæ Linn.
Jhora and Jhorka	Oryza sativa, var. fatua Linn.
Joha	Scented rice.
Jowar	Sorghum vulgare Pers.
Keja	Saccharum spontaneum Linn.
Khag	Arundo donax Linn.
Khesari	Lathyrus sativus Linn.
Khudi	Broken rice.
Lahi	Early sail.
Masuri, masur, Lentil	Ervum lens.
Matikalai, Urid, Blackgram ...	Phaseolus mungo, var. roxburghii Prain.
Matua	Panicum paludosum Roxb.
Mug, Mung, Green gram ...	Phaseolus radiatus Linn.
Nal	Phragmitis maxmia Blatter.
Napier grass	Pennisetum purpureum.
Para, Mauritius grass	Nrachiaria mutica (Forsk) Stapf.
Phutki	Hygrorhiza asiatica Ness.
Sail or Sali	Transplanted winter rice.
Shil tatoo	Sacchiolepis interrupta Stapf.
Tendara	Hymenachne myuros Beauv.
Vet or Shafla	Nymphoea stellata Wild.
Water hyacinth	Eichornia crassipes.

A. G. P. (Edn.) No.11—605—18-4-1941

GOVERNMENT OF ASSAM

ORDERS BY THE GOVERNOR

Resolution on the Report of the Department of Agriculture, Assam, for the year ending the 31st March 1940.

Extract from the proceedings of the Government of Assam in the Education Department, No. 606-E., dated the 10th March 1941.

READ—

The Report of the Department of Agriculture, Assam, for the year ending the 31st March 1940.

RESOLUTION

The year under review was marked with an extension of the activities of the Department in various directions. There was an all round determination to do all that was possible to improve the condition of the agriculturists. Research and experiment, especially on important crops like paddy, sugarcane, potato, deciduous and citrus fruits, marketing facilities for important fruits, distribution of improved seeds, improvement of livestock and supervision of Co-operative Milk Unions, all received their due share of attention. An Animal Nutrition Scheme, partially financed by the Imperial Council of Agricultural Research, was started at the Khanapara Cattle Breeding Farm. Improved varieties of seeds were made available to the public. Demonstration and propaganda were vigorously conducted. Agricultural Marketing Survey on sugar and lac was completed and that on jute and cotton was under progress. The Jute Propaganda Staff maintained by the Indian Central Jute Committee helped the jute growers with advice and improved varieties of jute seeds. The Agricultural Training classes at Sylhet and Jorhat continued their useful work. Advantages given for marketing Assam oranges and pine apples in Calcutta by posting an officer of the Department there have been found to be of much benefit to the growers. The Seed Depots at Sylhet, Jorhat and Gauhati were worked more satisfactorily during the year.

Extended activities of the Livestock section under the Deputy Director of Agriculture, Livestock, appear to have

attracted the attention of the public, and the demand for improved stock of cattle, goats and poultry and milk supply has steadily increased. In the year under review there were 28 village cattle breeding centres as against 24 centres in the previous year. Two hundred and sixty-eight breeding bulls were kept at these centres as against 238 bulls in the previous year. Twenty-nine bulls were kept with Municipalities, tea estates and private individuals. The Veterinary Department continued castration of weedy bulls, while the Livestock Improvement Association of Assam maintained 591 bulls for service in the villages. Fodder gardens increased from 49 to 157, and a very large number of grass roots were distributed to the villagers.

An outstanding feature in the year was the launching of Rural Reconstruction Campaign. Thirty-four Model Villages were started financed entirely by the Provincial Government. An Officer called a Model Village Organiser was placed incharge of each Model village. It is remarkable that the Officers of all Departments have associated themselves in its activities to make it a success, which the Government very much appreciate and expect that such officers will be taking increased interest in the activities of the scheme to make it what it is intended to be.

Government note with satisfaction the growing popularity of the Department. Their thanks are due to Dr. S. K. Mitra, Director of Agriculture, for his efficient administration and interesting report.

Order:—Ordered that the Resolution be published in the *Assam Gazette*.

By order of the Governor of Assam,

ABDUL HYE CHAUDHURI,

Deputy Secretary to the Government of Assam,
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